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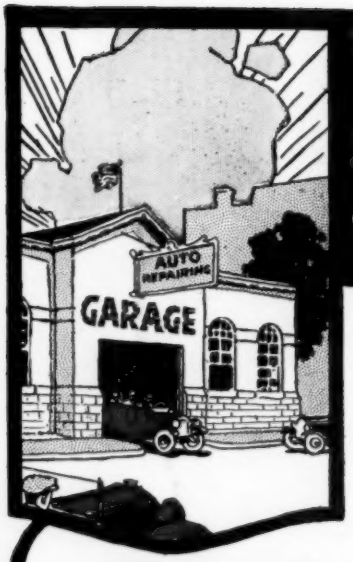
See Page 226



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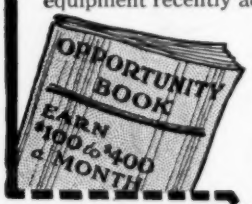

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Popular Mechanics Magazine

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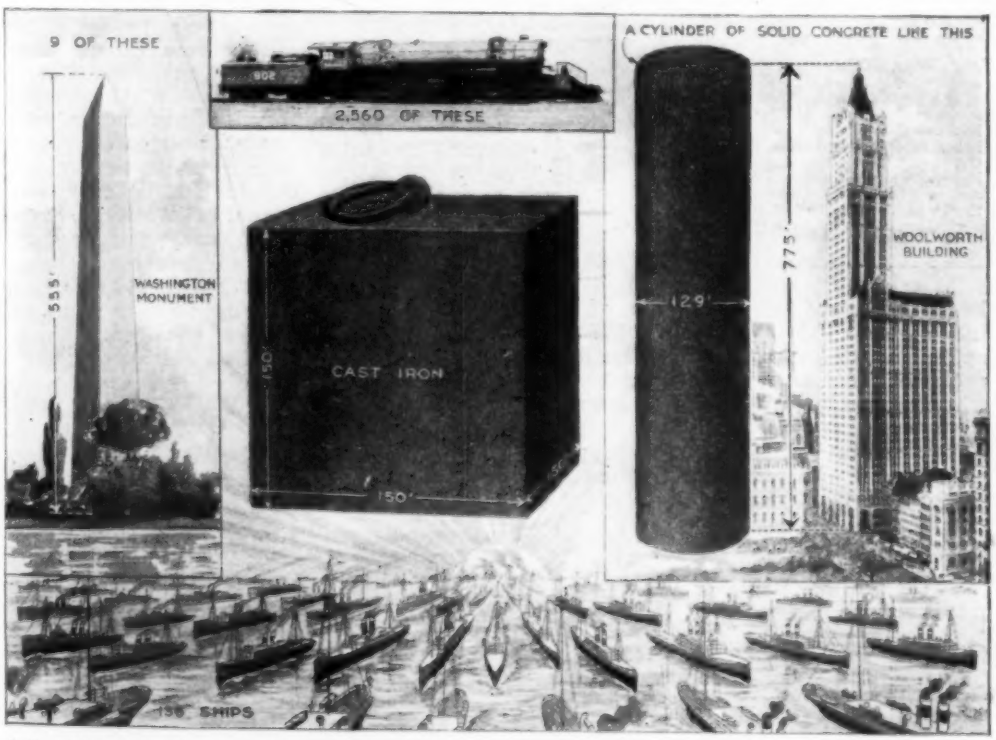
Vol. 32 AUGUST, 1919 No. 2

One Month's Enormous Ship Tonnage

SHIPS to the number of 136, with a dead-weight tonnage reaching the enormous total of 768,025, were delivered to the government by the Emergency Fleet Corporation last May. The magnitude of this single month's shipyard output may be more readily grasped by comparison with familiar objects. "Dead-weight tonnage," in shipping parlance, denotes the total number of tons of 2,240 lb. that can be transported. This fleet of 135 vessels could carry in one trip a load equal to nine obelisks like the Washington monument; or four giant 40-story structures like the New York Municipal Building; or a cylinder of solid concrete as high as the 55-story Woolworth Building and 129 ft. in diameter; or a 150-ft. cube of cast iron. It would take more than 2,500 of the largest 16-drivewheel locomotives to equal a full load, while so far as mere weight is concerned, the entire populations of Greater New York, Chicago, Philadelphia, St. Louis, Boston, and Cleveland would not overburden the fleet, and—if people could be packed like merchandise—might be moved in a single mammoth excursion. This record month saw, in addition, the launching of 137 other ships in various parts of the country, and keels laid for 80 more. It is an interesting coincidence that the Panama Canal's record month was May, 1918, with a total cargo tonnage of 780,041.



A Graphic Illustration of the Carrying Capacity of the 136 Ships Delivered to the Government in One Month: Nine Washington Monuments; a 150-Foot Cube of Iron; 2,560 Huge Locomotives, or a 129-Foot Cylinder of Concrete as High as the Woolworth Building

DESK AND CHAIR COMBINED IN LATEST FURNITURE

For use in schools and offices, a piece of furniture in which are combined a desk and a chair, is a late addition to the market. There are two types, one of which has a small tilting desk, adjustable to any angle. In the other a larger flat desk is provided. An extension, from the point where normally would be fitted the right front leg of the chair, supports the table at the proper height. On the support is a bookrack, while underneath the seat of the chair is a large drawer. Besides the extension support, the flat desk has a hinged leg at the left front corner. Metal braces at points subject to extra strain add strength to the chair.

A Desk and Chair are Combined Here in a Neat Manner. Lower Picture Shows a Tilting-Top Desk, and the Other a Flat Top. A Drawer under the Seat and a Bookrack on the Table Support Are Conveniences

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¶ Persons willing to submit to blood-transfusion operations are being examined and listed by the medical society of a California city, so that they may be called upon in case of an emergency. Under ordinary circumstances valuable time is lost examining volunteers.

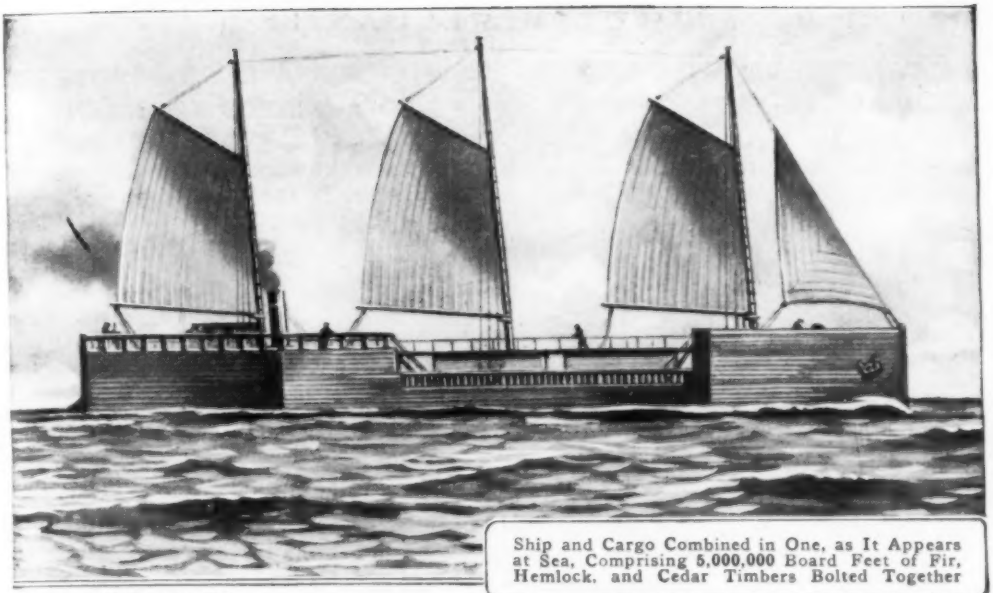
CHICAGO'S FOREST PRESERVE PREPARED FOR VISITORS

The remarkable wilderness belt that borders the city of Chicago, perpetuated under the name of the Cook County Forest Preserve, has been well prepared for the entertainment of its 2,500,000 human neighbors. In its 15,000 acres of natural woodland the campers will find places already marked out for their fires, and free firewood actually piled conveniently near for their use, where the foresters have left it after the winter cleaning. Springs have been inclosed in concrete basins, and new wells have been driven. Along the network of concrete highways that intersect the preserve, 53 miles of which are under way, little side clearings have been prepared to invite the campers or picnic parties. At one point a dam, built at a total cost of about $500, has formed a 30-acre lake, 12 ft. deep, whose waters are discharged in a tiny cascade. The lake has been stocked with black bass and bluegills for the benefit of the amateur anglers, and a bathing beach of clean white sand formed by the simple process of placing the sand on the ice last winter and letting it sink when the thaw came. Eventually the preserve is to embrace 30,000 acres, all parts of which will be accessible by improved roads, many of them concrete surfaced.

DEMOUNTABLE LUMBER SHIP IS BUILT OF ITS OWN CARGO

A most remarkable 9,000-ton ship, destined to make but one voyage of 9,000 miles, is being built in a British Columbia shipyard. Its purpose is to carry 5,000,000 ft. of lumber to England; but when it arrives at its destination, instead of being unloaded, it will simply be taken apart and turned bodily into a huge lumber pile. For the new vessel is all cargo, and the cargo forms the vessel.

The method of construction is to lay down the keel and fore-and-aft cross timbers, complete a skeleton bottom, mount donkey engines on the structure, and then launch that portion of the vessel.



Ship and Cargo Combined in One, as It Appears at Sea, Comprising 5,000,000 Board Feet of Fir, Hemlock, and Cedar Timbers Bolted Together

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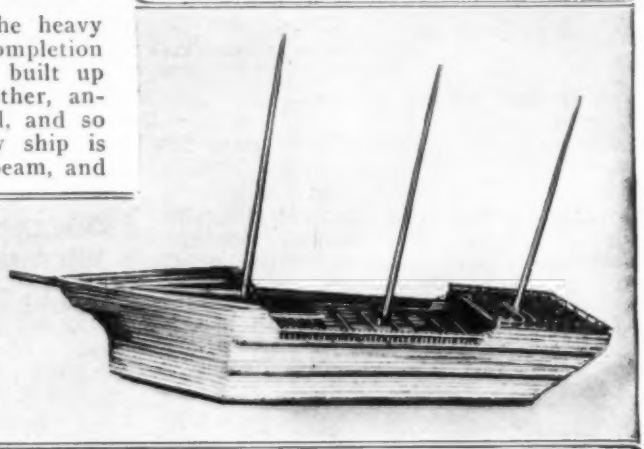
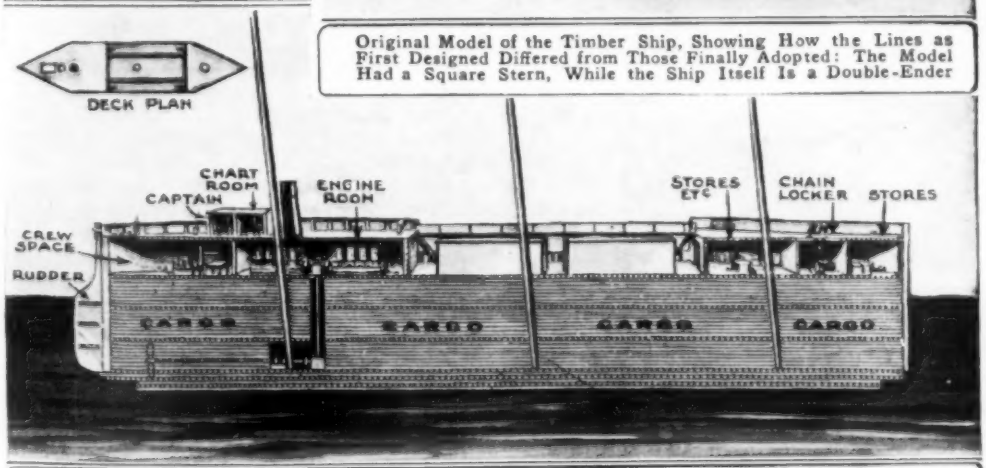
The donkey engines hoist the heavy timbers aboard for the completion of the ship. The sides are built up for 8 or 10 ft., bolted together, another course laid and bolted, and so on, until a solid, seaworthy ship is finished, 250 ft. long, 60 ft. beam, and 36 ft. deep. The sail equipment is supplemented with twin-screw drive, and comfortable quarters are provided for officers and crew. The cost is declared not to exceed that of loading an ordinary vessel.



Original Model of the Timber Ship, Showing How the Lines as First Designed Differed from Those Finally Adopted: The Model Had a Square Stern, While the Ship Itself Is a Double-Ender

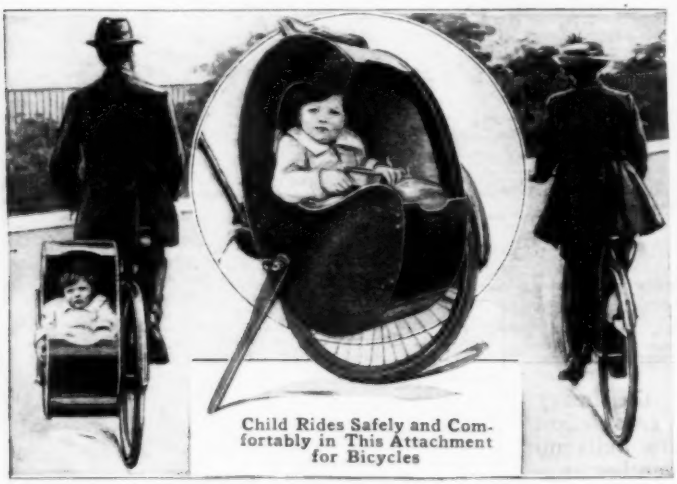


Longitudinal Section, Revealing the Method of Laying the Timber Cargo to Form the Body of the Ship, and Indicating the Location of Quarters for Officers and Crew, Engine and Storage Space: In the Upper Left Corner the Shape of the Vessel is Shown by a Diagram of the Deck

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine

BABY RIDES WITH PARENTS IN BICYCLE ATTACHMENT

Parents who are reluctant to leave baby behind when they go for a spin on their bicycles will be interested in an attachment designed by an Englishman for carrying a small child on his bicycle. The "go-go," as the inventor calls it, is a drum of sheet iron, attached alongside the rear wheel of the machine, with a portion cut away to afford the tiny occupant fresh air and a view of the scenery.



Child Rides Safely and Comfortably in This Attachment for Bicycles

EMERGENCY COAT UNLACES FOR QUICK REMOVAL

Laced together with shoestrings, the five-piece coat made by a Baltimore tailor may be dismembered and removed in a minute. The garment is being urged by the maker as one for soldiers, sailors, or others who lead hazardous lives. In case of injury, where the quick and easy removal of one part of a garment is an advantage, pulling out one string will disconnect any part of the coat from the remainder. Lacing is through metal eyelets.

MINNESOTA CITIES PROPOSE ROAD ALONG MISSISSIPPI

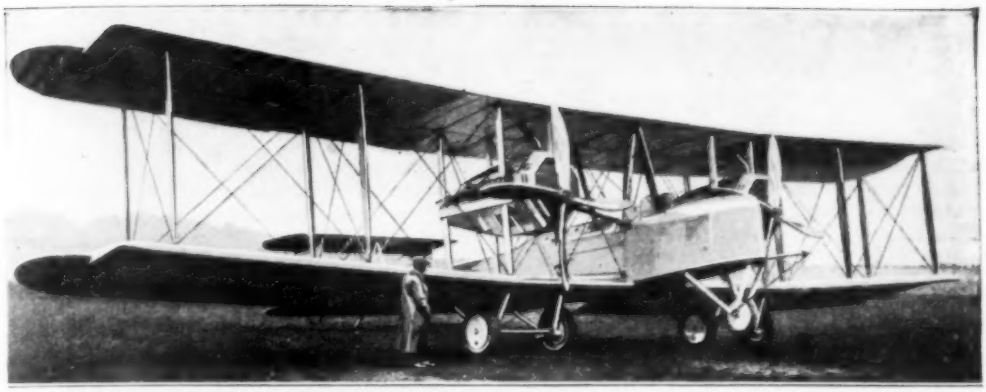
Another great highway to connect the North and the South is being urged by organizations in the more important cities of Minnesota. Paralleling the Mississippi River, this highway would extend from Lake Itasca, the source of the river, to New Orleans, a distance of 3,000 miles. This route would mean a drop of practically 1,575 ft. in traveling from the lake to the river's mouth. Those promoting the idea point out that the trail would not only be one of scenic interest, but that it would serve to bring about closer relations of the people in the two sections of the country.

Numerous large cities are located on the proposed trail, assuring tourists of up-to-date hotel and garage accommodations.

NEW OPPORTUNITIES OFFERED RECRUITS IN REGULAR ARMY

The U. S. Army is offering to men enlisting for a three-year term many educational advantages. Young men possessing preliminary education may enlist in the Medical Corps with a view to training as X-ray manipulators. They will be given a three-months' course at the Army Medical School, Washington, D. C. Instructions will cover electrophysics, construction and operation of all types of X-ray apparatus, the U. S. Army X-ray ambulance, the bedside X-ray, and the portable field type of apparatus; darkroom work, photography; electrical wiring, installation, care and repair of X-ray and electrical apparatus; gas-engine construction and their care and repair, etc. Application for this enlistment should be made to the Surgeon General, U. S. Army, Washington, D. C., attention of the Chief, Section of Roentgenology.

¶ Telephones are so scarce in Japan that not long ago there were 152,000 names on a list of persons waiting for the installation of instruments. Brokers deal in telephones, selling those which are discontinued at a regular market price.



This Is the Vickers-Vimy Bomber, the First Man-Made Machine to Fly, without a Stop, across the Atlantic Ocean. The Fuselage was Crammed with Gasoline Tanks from the Nose Almost to the Tail, Space being Spared Only for the Small Cockpit in Which Sat Pilot Alcock and Navigator Brown. Either One of the Two Engines could have Driven the Plane at a Good Speed Except at the Start When Heavily Loaded

UNHERALDED NONSTOP FLIGHT SPANS ATLANTIC

By PAUL A. JENKINS

IN writing the story of the "NC-4" one told of months spent in painstaking experiment and preparation, of destroyers and battleships strung across the ocean, and of a "slow but sure" policy which made success almost certain. In dramatic contrast to all this is the tale of the first nonstop transatlantic flight made by Capt. John Alcock and Lieut. Arthur W. Brown on June 14-15, 1919. This is the story of an airplane and two men.

Their Vickers-Vimy biplane was simply a stock model of a type supplied to the British government for night-bombing raids. As such machines go, it was far from large, having a wing span of only 67 ft. But "sweetness" of design and ease of control made the type a favorite with many pilots. Two 350-hp. Rolls-Royce engines were mounted, one on either side of the fuselage, on tubular steel struts. With this power plant the machine was rated at more than 100 miles an hour.

Alcock and Brown are anything but seafaring men. They are both land fliers, rather, but with the broadest experience in that line. Alcock has flown since 1911, often competing with Hawker and Raynham in the early days. During the war he starred in many long-distance bombing raids over Constantinople and other Turkish strongholds, finally falling within the enemy lines to remain a prisoner until the signing of the armistice. On his return to England he signed up with Vickers as a test pilot; and in that capacity successfully pleaded with his firm for permission to try the transatlantic flight. His confidence in himself and his machine were so evident that permission was granted.

Brown, the American, was likewise a prisoner of war for many months, after a career with the British army which dated back to 1914. As an aerial observer he made a name for himself on the western front, until his crash within the German lines. The odd thing about Brown is that he never had any real navigating experience before the "big hop." He had regarded navigation as a mental hobby which he studied with scholarly application. Yet he started from Newfoundland with seemingly absolute confidence in his ability to guide the plane to the center of the Irish coast. And he hit it with almost mathematical precision.

Some weeks of preparation were spent at the improvised aerodrome near St. John's, Newfoundland. Gasoline tanks were squeezed into every available cornet of the Vickers-Vimy fuselage. On seeing the skeleton before the application of the canvas covering, some one actually likened the machine to a collection of cans. These tanks held 865 gal. of gasoline, every drop of which was filtered through wire screen and chamois before entering the plane. This, by the way, was a lesson learned from Hawker's disaster in mid-ocean. With other equally elaborate precautions the preliminaries were completed by June 14.

On that afternoon, Alcock and Brown decided to wait no longer. They had seen their huge rival, the Handley Page, in easy flight above their aerodrome, and knew that haste was imperative. A nasty, choppy gale was blowing; but

they decided to risk all. They clambered into their side-by-side seats in the cramped little cockpit. Places were found for the cat, the dog, and the four-pound sack of mail. At 12:13 p. m., New York time, mechanics jerked the chocks from before the wheels. Alcock threw both throttles wide open; the plane gathered speed for the uphill dash across the little field. Burdened almost beyond its capacity, it barely cleared hedges, trees, and houses. But as the engines fought with every bit of their power, they gradually mastered the 40-mile gale; and the biplane turned east with the wind, and streaked for Ireland. The wind, which almost prevented the take-off, now added tremendously to the speed. But the battle had been won at the cost of a broken wireless propeller, striking the Vickers-Vimy dumb for the whole of the lonely trip.

Yet the two men sped on. The wind held at their backs, but the air grew thick with fog. It continued thick. Navigator Brown made only four observations during the entire flight. Past midnight, fog thickened to snow and hail. By six o'clock in the morning both fuselage and wings were covered with ice. Brown was continually forced to climb up in the fuselage to chip ice from indicators and other essential instruments.

So they fought on until within an hour of the Irish coast. Then the weather cleared; and after 16 hours of flying, the two men rejoiced to see the coast line. Tired and happy, they decided to land at once in order to clinch the prize, which might easily be lost were they to sink off the coast of England. Alcock peered down through Brown's window in the fuselage bottom, and picked what seemed to be a good landing field. Gliding down around the wireless tower at Clifden, the weather-beaten machine touched ground, rolled a few yards, and stopped short with a jar. Alcock had completed the world's first nonstop transatlantic flight by landing in a sticky Irish bog.

They didn't care much. They had won approximately $75,000 in prize money by a record-smashing flight of 1,950 land miles in 16 hr. 12 min., about two hours less than the fastest railroad time between New York and Chicago.

They had left two other competitors back in Newfoundland. The giant Handley Page had already made a trial flight. Indeed, it was this very performance which hastened the departure of the victors. The 130-ft. bomber was a very promising competitor, too, with its four Rolls-Royce engines driving it at a speed of 100 miles an hour. The rebuilt Martinsyde was there, also, mechanics hurrying the installation of a new motor.

Other organizations were busy with preparations over in England. The Shortt machine, which fell in the Irish Sea, had been repaired. The Boulton and Paul bomber, and the Alliance entry, were about to start for Newfoundland. The single-motored Fairey seaplane was also a respected contestant because of its variable-camber wings, which permit ascension with a heavy load and great speed

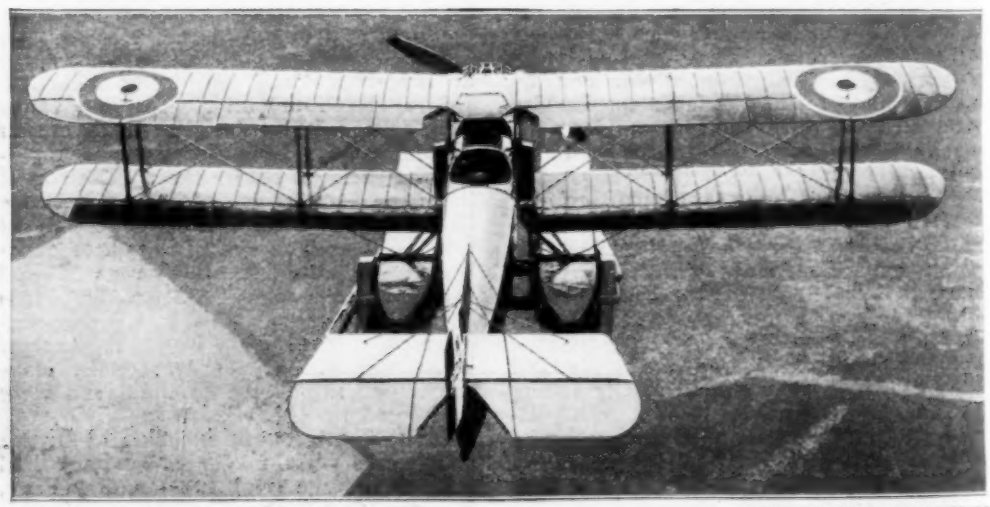
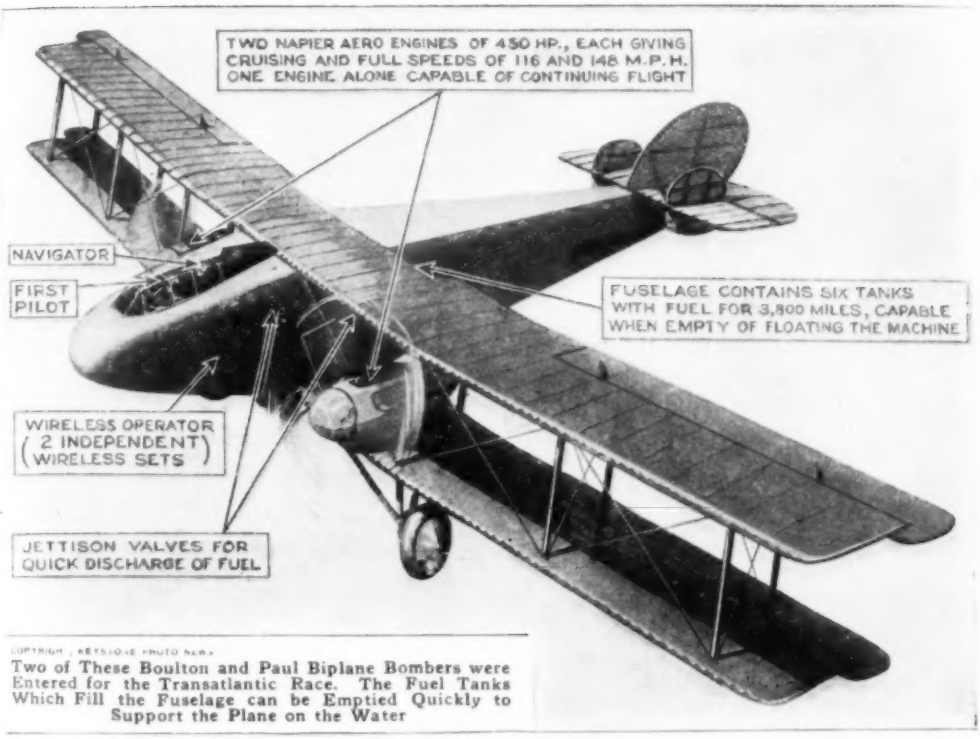


PHOTO BY CENTRAL NEWS PHOTO SERVICE

The Interesting Feature of This Fairey Seaplane, Is the Adjustable Rear, or "Trailing," Edges Hinged to the Wings. By Depressing Them, the Pilot Adds to the Lifting Power of His Plane and Decreases Its Speed; by Alining Them with the Rest of the Wing Section, He Lessens Lift but Increases Speed


TWO NAPIER AERO ENGINES OF 450 HP., EACH GIVING CRUISING AND FULL SPEEDS OF 116 AND 148 M.P.H. ONE ENGINE ALONE CAPABLE OF CONTINUING FLIGHT
NAVIGATOR
FIRST PILOT
FUSELAGE CONTAINS SIX TANKS WITH FUEL FOR 3,800 MILES, CAPABLE WHEN EMPTY OF FLOATING THE MACHINE
WIRELESS OPERATOR (2 INDEPENDENT WIRELESS SETS)
JETTISON VALVES FOR QUICK DISCHARGE OF FUEL

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Two of These Boulton and Paul Biplane Bombers were Entered for the Transatlantic Race. The Fuel Tanks Which Fill the Fuselage can be Emptied Quickly to Support the Plane on the Water

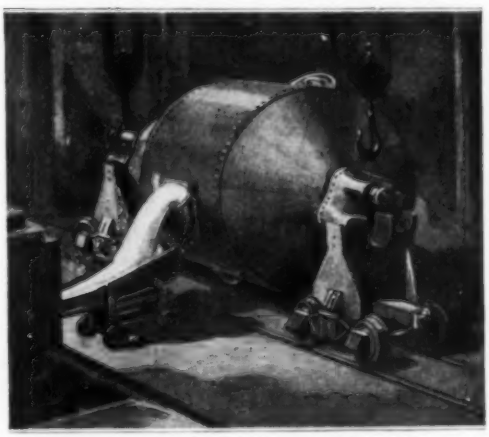
on the straightaway. The four-motored Whitehead bomber and Colonel Porte's gigantic triplane flying boat were also reckoned as possible starters. It was known that transatlantic enterprises were afoot in Italy and France.

USE FUSIBLE METAL TO STOP FOULING OF GUN BARREL

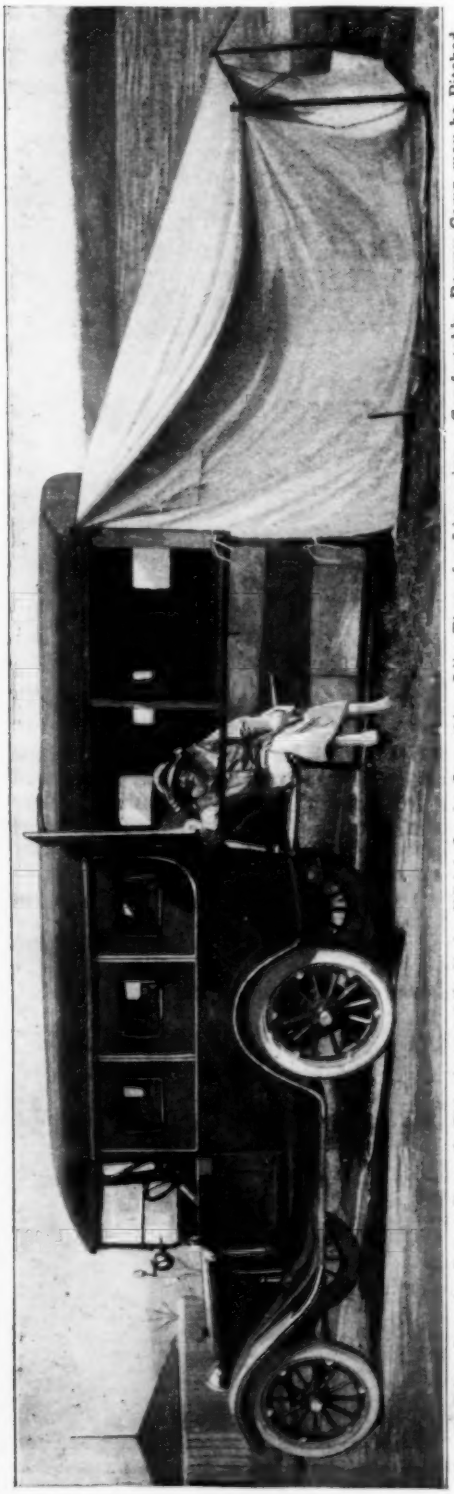
An alloy composed of 60 per cent tin and 40 per cent lead, placed in the chamber of a gun, is reported to be effective in stopping the fouling of the barrel by the copper of the shell driving bands. Firing breaks up the alloy, the tin of which joins the copper to form a new fusible alloy. This is made more readily removable by its granular form, due to the presence of the lead, which also lubricates the barrel for subsequent shots.

SPECIAL CAR BODY CARRIES AND POURS MOLTEN METAL

A car mounted on trucks of the usual railroad type, with a body which will carry molten metal, keep it hot, or pour it out, has been designed by a Pennsylvania inventor. The car body is cylindrical, with conical ends journaled in trunnions at front and rear of the truck. It is lined with refractory material, and provided with a spout at each side, so that the metal may be poured by tilting the body either way. Holes in the spout covers allow the insertion of heating elements for maintaining the fluid condition of the contents. Lugs for attaching tackle are provided at the ends of the body so that the latter may be hoisted from the truck.



Car for Molten Metal, Whose Body Is a Cylindrical Ladle, Pivoted at the Ends and Tilted for Pouring



By Drawing Out the Inner Part of This Automobile Body, Which Looks Something Like That of a Limousine, a Comfortable, Roomy Camp may be Pitched. Additional Tents, Placed at the Sides and Rear of the Extension, Enlarge the Quarters. Rubber-Tired Rollers on the Telescoping Part Eliminate Noise

ACCOMMODATION FOR FAMILY IN TELESCOPIC AUTO

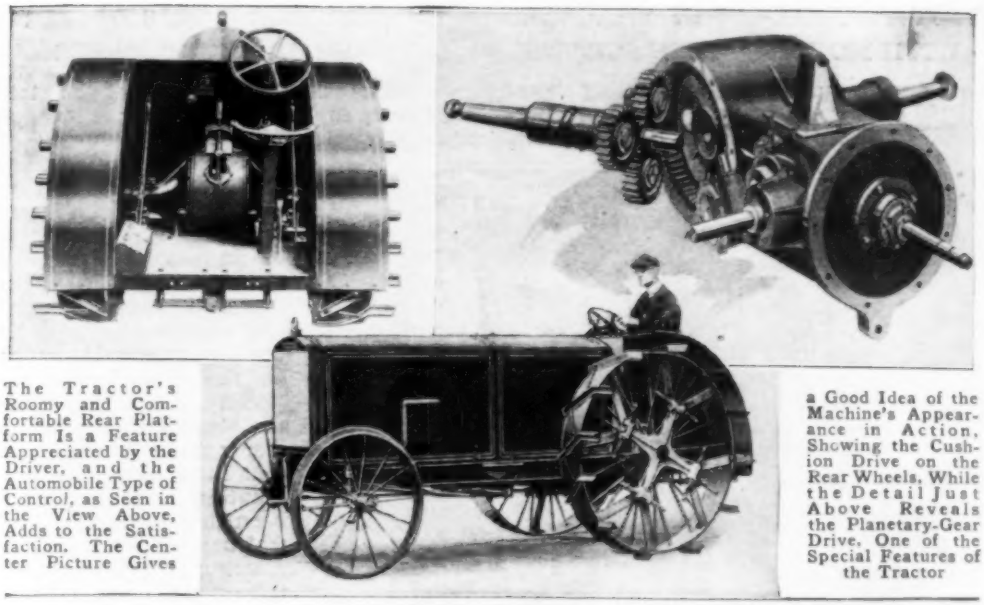
A family camping outfit is provided by a telescopic automobile body for which the inventor has asked a patent. By placing lean-to tents at the sides and rear of the extension, considerably more shelter may be obtained. The extension slides into a specially constructed body, which in some particulars resembles that of a limousine. Two swinging doors at the rear admit the telescoping part, which runs on rubber-tired rollers.

SILENT MOTOR AND PROPELLER TO MAKE AIRPLANE POPULAR

In discussing the inconvenience and fatigue caused by the continuous roaring of an airplane's motor and propeller, a British official has declared that the elimination of all noise is not only possible, but certain to be attained in the near future. An experienced airman pays little attention to this ceaseless racket; but it is certain that the unnoticed strain on the nerves impairs efficiency and lessens his endurance. The official points out that airplaning will never be a truly popular activity until this nuisance is removed. However, he believes that flying is even now as safe and convenient as travel in a fast express train.

NEW KEROSENE TRACTOR HAS NOVEL DRIVING SYSTEM

A kerosene-burning farm tractor, recently brought out by an Illinois manufacturer, embodies a number of unusual features, not the least important, from the driver's standpoint, being the roomy, comfortable, and convenient platform at the rear. Mechanically the machine is interesting for its driving system and spring-cushioned wheels. Sets of planetary gears are used to drive a live rear axle, reducing strain, friction, and chance of trouble, and considerably increasing the transmitted power. The floating driving wheels are turned by four-point spiders on the ends of the live axle, acting on the wheel rims through cushioning springs which effectually absorb all shocks. The machine's speed rating may be changed by removing a cover on the side of the transmission case and transposing two cross-over gears. In a few minutes, with a wrench and screwdriver, the speed is altered from 2½ and 3½ to



The Tractor's Roomy and Comfortable Rear Platform Is a Feature Appreciated by the Driver, and the Automobile Type of Control, as Seen in the View Above, Adds to the Satisfaction. The Center Picture Gives a Good Idea of the Machine's Appearance in Action, Showing the Cushion Drive on the Rear Wheels, While the Detail Just Above Reveals the Planetary-Gear Drive, One of the Special Features of the Tractor

1½ and 2½ miles an hour. The inclosed transmission, engine cradle, and front-axle support form a unit upon which the whole tractor is mounted, making twisted frames out of the question, and keeping all parts in alinement.

LARGE CABIN MARKS BRITAIN'S FIRST COMMERCIAL AIRPLANE

The "Bat" commercial biplane represents one of the first attempts made by British manufacturers to break away from the customary war-time designs. The machine has been planned and built solely for the transportation of four passengers or 2,000 lb. of freight. As fitted for passenger traffic, the 8 by 3-ft. cabin is handsomely decorated, and furnished with four comfortable armchairs, a telephone to the pilot, and an altimeter and speed indicator, which tell the passengers how high and how fast they are traveling. Last, but far from least, the passengers are permitted to smoke. The pilot's cockpit is placed, very unconventionally, within a few feet of the tail, the unusual position giving him larger field of vision than he ordinarily enjoys.

¶It has been discovered that a pulp suitable for a coarse grade of paper and cardboard can be made from the larger yellow-pine chips from which turpentine, resin, and pine oil have been extracted by distillation.

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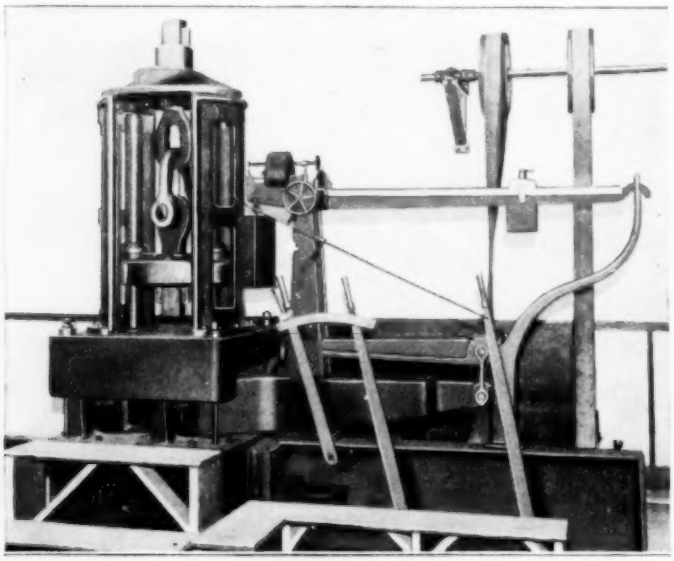
This "Bat" Is an English Passenger Plane, and One of the First to be Built Solely for Commercial Use. The Fuselage has been Designed around the Cabin, Which Is Unusually Comfortable for So Small a Plane. Note That the Passenger at the Left is Enjoying a Cigarette without Fear of a Gasoline Explosion

TEST ANCHOR-CHAIN SHACKLES WITH MOTOR-DRIVEN SCREWS

A testing machine with a pulling power of 150 tons is used to try out the anchor-chain shackles for vessels of the Emergency Fleet Corporation. Motor-driven screws apply the strain, the standard test being 141,680 lb., or practically 71 tons. One out of every 25 shackles, however, must withstand 99 tons of dead-weight pull without showing any signs of failure.



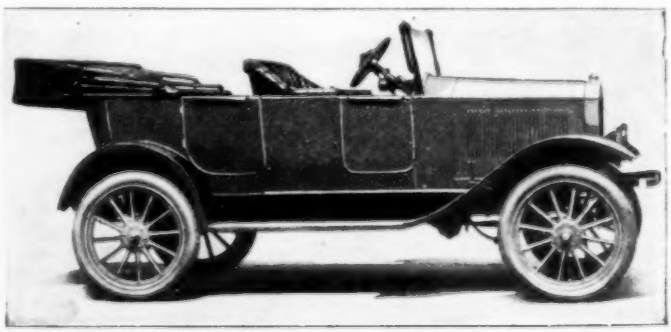
The Vertical Screws Visible inside the Testing Frame are Geared to a Motor Drive Shaft, and, When They Revolve, Exert a Pulling Force Up to 150 Tons against the Shackle being Tested

PREHISTORIC TEXAS TRIBES THREE DISTINCT TYPES

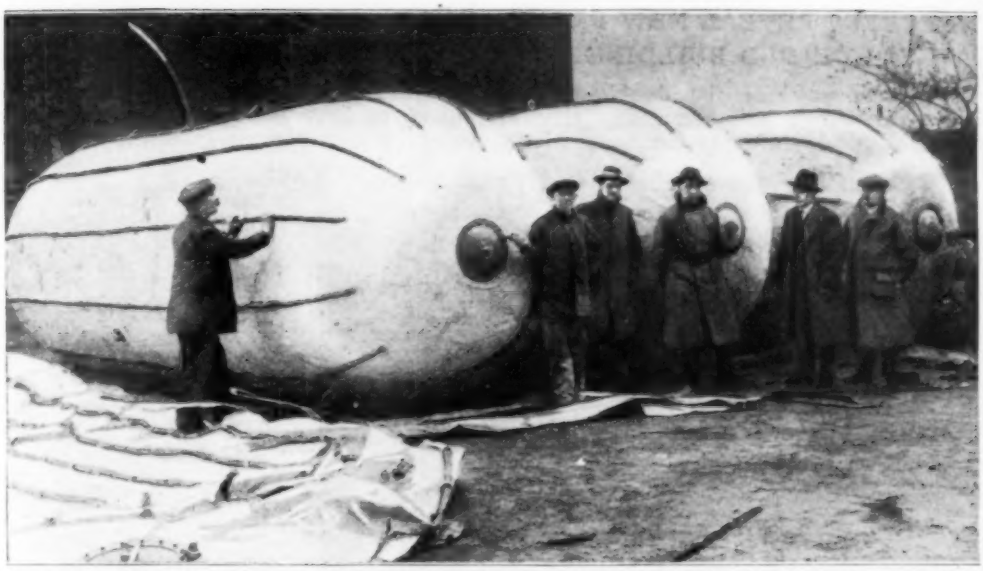
A preliminary examination of the state of Texas, to be followed by a thorough archeological survey by the Bureau of American Ethnology, has disclosed the fact that the territory which forms the state was inhabited, in prehistoric times, by three distinct types of Indians. Those of the eastern part were agricultural people, and skilled in the manufacture of pottery, as is shown by the stone farming implements and earthenware that have been found. Hunters' weapons have been dug up in the central part of the state, indicating that the ancient tribe which once lived in that section was composed of devotees of the chase. In the extreme western portion of the state, a tribe much like the Pueblos of New Mexico appear to have lived in olden times. Texas is believed by the archeologists to be a fertile field for their operations, as the cursory examination has brought to light a wealth of material, and because the state never has been the scene of systematic research work.

CLASSY STREAMLINE HOOD CAMOUFLAGES CAR

There has recently been placed on the market an outfit that will give to a cheap car the appearance of a much more expensive one. The change is made by using a new engine cover and cowl of the latest type; new windshield brackets which give the required tilt, and new running boards and lamp fittings. The ordinary radiator is used, but is covered by a silverplated shell to conform to the new design. It is equipped with a modern radiator shutter. The change can be made in a day, and the car is not damaged in any way, as the standard bolt holes are used.



The Casual Observer Might be Excused for Mistaking the Identity of This Low-Priced Car, Equipped with a New Streamline Hood and Cowl, Silverplated Radiator Shell, and a Stylish Slanting Windshield



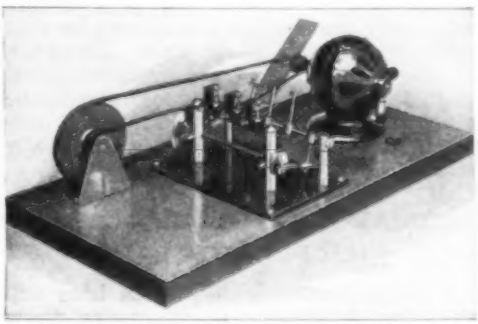
Collapsible "Camels" for Raising Sunken Ships: They are Placed Inside the Ship Deflated and are Then Pumped Up as Indicated by Three of the Four Shown in the Picture

COLLAPSIBLE CANVAS "CAMELS" RAISE SUNKEN SHIPS

A ship-salvaging "camel" that is blown up like an automobile tire has been invented by a British naval officer, and is already doing good work among sunken vessels. Shaped like a small dirigible balloon, the camel is made of laminations of specially prepared vulcanized canvas. It is protected by longitudinal rope fenders and provided with flat flexible-steel moving bands. Three air connections at different points make for convenience in handling, and a pressure regulator prevents overinflation. Deflated, the big bags are introduced through porthole or hatchway into the sunken ship, and then air is pumped in until the vessel rises. A special steel clip for fastening to a ship's side allows the external use of the camels if necessary, avoiding the difficult task of placing cables under the hull.

LITTLE MACHINE TESTS CHAINS IN AIRPLANE ALTIMETERS

Modern war is fought in the laboratory as much as on the field of battle. Consider, as one of a thousand instances, the altimeters, or aneroid barometers, which were fitted to the instrument boards of the fighting airplanes. Discovering a tendency to rust and stiffen in the thread-like chain which connects diaphragm and indicator, the government asked the Bureau of Standards to produce a faultless chain. So the scientists in their laboratories built a little machine which slowly wound and unwound the chains under test, just as they would be twisted by the action of the altimeters. After the operation had been performed millions of times, the chains were microscopically examined for defects. In studying the illustration, the reciprocating action of



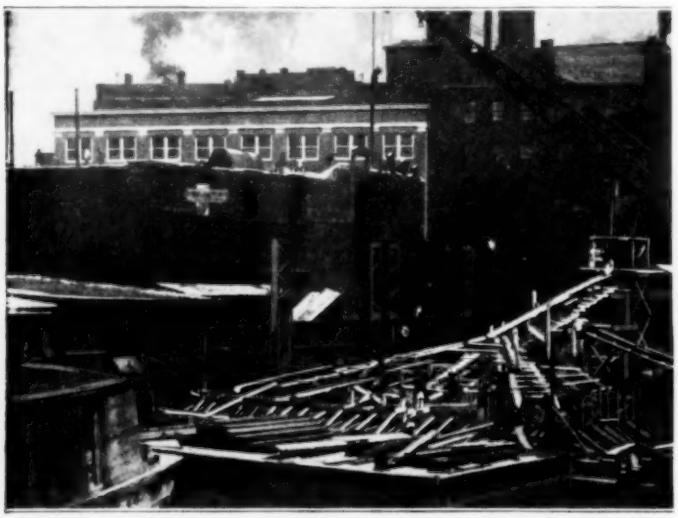
This Mechanism was Used in Making War-Time Tests on the Strength of the Tiny Barometer Chains Which Connect Diaphragm and Indicator

the mechanism will become clear when one notices the hairsprings under the winding drums.

The Canadian Pacific Railway has applied for a charter to operate an aerial freight and passenger service.

WRECKERS REVEAL NEW FRONT INSIDE OLD BUILDING

To make way for the double-decked boulevard which will some day relieve Chicago's down-town traffic congestion,



When Wreckers Demolished Part of This Old Warehouse to Make Way for Chicago's Down-Town Boulevard Improvement, They Found the New Front Already in Place

it has been necessary to cut through scores of warehouses and office buildings. Considerable litigation before the rights or demands of one warehouse were determined threatened to hold up the owners' reconstruction program indefinitely. They could not proceed to rebuild while the case was in the courts, as that would jeopardize their suit. However, they secretly erected a new front, complete with windows and doors, inside the old building. This was discovered only when wrecking operations were finally resumed.

DRAINAGE WILL RECLAIM RICH FLORIDA LAND

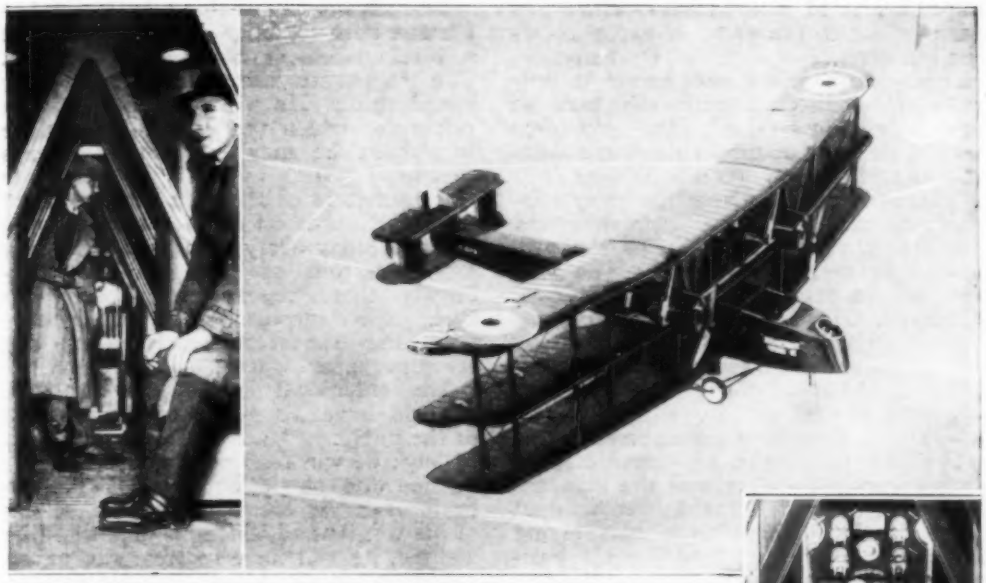
A large area of rich Florida land will be made available for cultivation by a drainage project about to be undertaken by the authorities of that state. The land is now covered by the waters of the St. John's River, which resembles a chain of small lakes more than a stream. About 1,000,000 acres will be reclaimed in the counties of Brevard, Osceola, Orange, and Volusia, in the central part of Florida. It has been estimated that the work will cost not less than $7 an acre, and perhaps $10 an acre will be required.

CAR RUN WITHOUT CARBURETOR GIVES SURPRISING MILEAGE

A Red Cross chauffeur in Paris is reported to have driven his car nearly 45 miles on one pint of gasoline, using no carburetor, but condensing and spraying the fuel directly into the cylinders by a method not disclosed. This is at the astonishing rate of 360 miles to the gallon. In the absence of any information as to the weight of car or the nature of the road traversed, comment on this extraordinary figure is more or less futile. With a car of standard equipment, tuned for the occasion and "nursed" along by a trained driver, an American car maker claims a record of 83 and a fraction miles on one gallon; but 25 is generally regarded as very high indeed. If the thermal efficiency of a gasoline engine with carburetor is around 20 per cent, this inventor appears to have attained more than 100 per cent.

SNAILS IN GLASS TUMBLER PHOTOGRAPHED BY TEXAN

Though proverbially the slowest-moving creatures on earth, snails have a way of getting to their destinations that is certain, if not swift. The photograph reproduced herewith was taken by a Texan while on a fishing trip. It shows in a glass tumbler a number of the mollusks, some of which have started on their "dash" for liberty. One appears to be much more speedy than his companions, for he has negotiated the rim of the glass, while many of the others are still at the bottom.



This Big English Triplane Bomber, Seen in Flight from Another Airplane, has Proved Its Worth as a Reliable Freight and Passenger Carrier. The Smaller Picture at the Left Shows the Interior of the Fuselage in Which the Transportation of a Large Cargo Is Possible Because of Freedom from Obstructing Wires

BIG TRIPLANE BOMBER PROVES COMMERCIAL SUCCESS

English advocates of the triplane construction for airplanes are pleased with the performances of the eight-ton Bristol bombers, now finding favor for commercial use. They stand 20 ft. 8 in. high, with a span of 81 ft. 8 in. and a length of 51 ft. 6 in.; yet their four Liberty engines, placed between the upper and middle wings, drive them at 125 miles an hour, while sound design makes them as responsive to the controls as a small biplane. Like most of the big machines they were designed for long-distance bombing raids into Hunland, on which they would have carried three guns and a ton of bombs. As modified for more peaceful work, they carry 14 passengers in a comfortable cabin. Elimination of cross-wires and careful arrangement of the gasoline tanks in the fuselage provides a passageway along which passengers may walk.

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This Picture was Taken from the Interior of the Fuselage and Shows the Pilot Coming Aboard

THE SMALL STORE MOVES TO STATE STREET

By E. T. BRONSDON

HERE is the greatest department store in the world. It is an establishment which answers all the questions and quarrels raised by monopoly and the chain-store plan. It is a department store in which each department is owned and controlled by a small dealer. It is designed especially to take a fall out of the cost of living because of lessened overhead. It is the new Chicago Market, which occupies the eight floors of a former department-store building.

Are you a small merchant, selling any sort of wares, from floral horseshoes to the hardware variety? Have you longed for years to place your business on the main artery of a large city? This store will give you the opportunity.

Are you a consumer of dry goods, groceries, household furnishings, and all the

impedimenta of modern life? Have you been driven to the point of explosion by the indifference of some department-store clerks, whose bread and butter is only remotely connected with the task of pleasing you in service? Have you often wished that you could see the owner himself and straighten out the tangle?

The new market gives you every convenience of a modern department store, yet brings you in touch with the proprietor in every department. The man you talk to actually owns all the goods displayed. He is taking your money for himself. He knows that he has to satisfy you or go broke. The personal responsibility of the small-town store therefore is combined with all the conveniences to which you have been accustomed.

For the proprietor, this new idea in stores promises a chance at the immense sales of a centrally located store without the obligation of high rent. In applying for space, the lessors examine his business. If it is sound, and not connected with hocus-pocus in any way, a contract is furnished. This contract calls for a certain percentage of his total gross sales, and is figured on the basis of profit the seller makes on each article. Thus the dealer can figure his overhead on every item, and can shave prices to the point that does away with all blind competition, giving the consumer and himself the benefit. The lessors take something of a chance on their own judgment with each foot of space they rent; but in the average they expect to make a good return on the whole building.

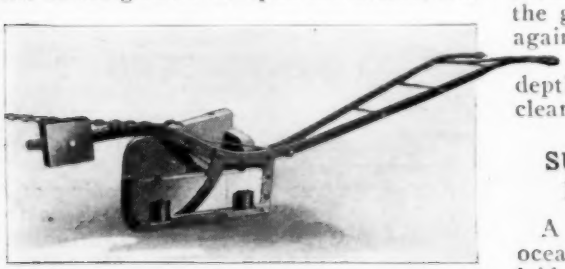
The advantages of this plan are so important both to seller and consumer that a brief statement of them is justified. The return to the consumer may be stated thus: He will buy at the lowest prices for which the best goods can be furnished; he may feel certain always that he is getting the best goods, because the promoters of the plan cannot afford to take chances on inferior articles; and because today every man who is making a success out of selling knows thoroughly that "repeat orders" are the basis of his success, the buyer may rely upon the utmost in service from any store organized on this plan.

The seller will be no less benefited. He will have his goods at the disposal of the public just where the public wants to buy; he will take no chance whatever outside the single chance he takes in business anywhere, namely, the selling of his wares; and, since his books will be audited, he will have to treat the public justly on all occasions, but for this he will be richly recompensed. In addition, he will have the advantage of coöperative buying, coöperative renting, and coöperative delivery, with coöperative collection behind him. For the man with an honest product at an honest price, all cares will vanish.

Argument—Bolshevistic or otherwise—always has claimed that the United States was heading direct into capitalistic control of all enterprise. "Trusts, chain stores, monopolies, big interests—how can the small merchant compete?" has been the line of talk. This is how.

STREET-GUTTER SNOWPLOW KEEPS DRAINAGE OPEN

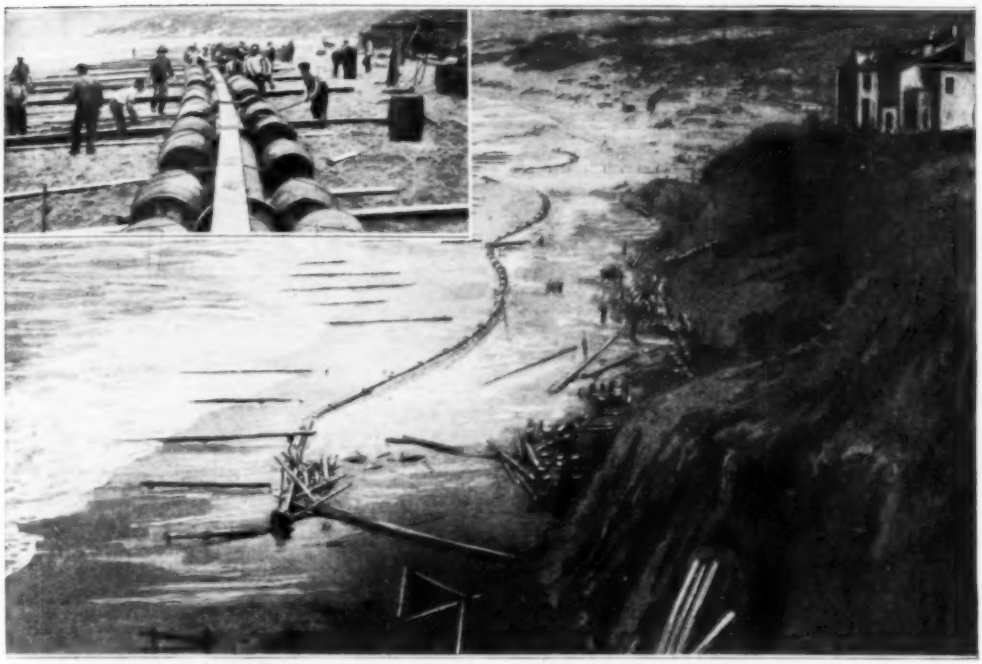
City property owners who, because of labor shortage in the winter of 1917-18, had to get out and dig heavy snow from the street gutters to open the drains, will be interested in a new English invention. It is simply a small V-plow, of redwood, shod and braced with steel, that cuts a clean 18-in. channel when drawn along the gutter by a horse. Two rollers bear against the curb, and a weight on the point adjusts the plow for varying depths of snow. With two men, it has cleared 23 miles in 14 hours.



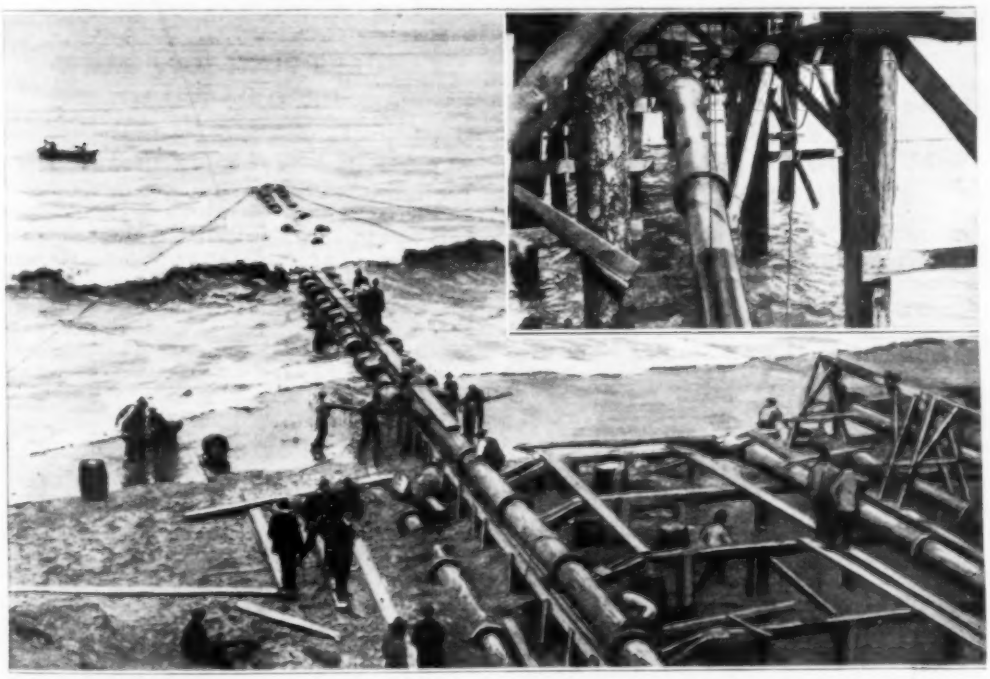
This Gutter Snowplow Cuts an 18-Inch Channel at a Rapid Rate, Keeping the Street Drainage Open; the Rollers Bear against the Curb, and the Movable Weight in Front Serves to Adjust the Plow to the Snow Depth

SUCCESS FOLLOWS MISHAPS IN LAYING OCEAN SEWER

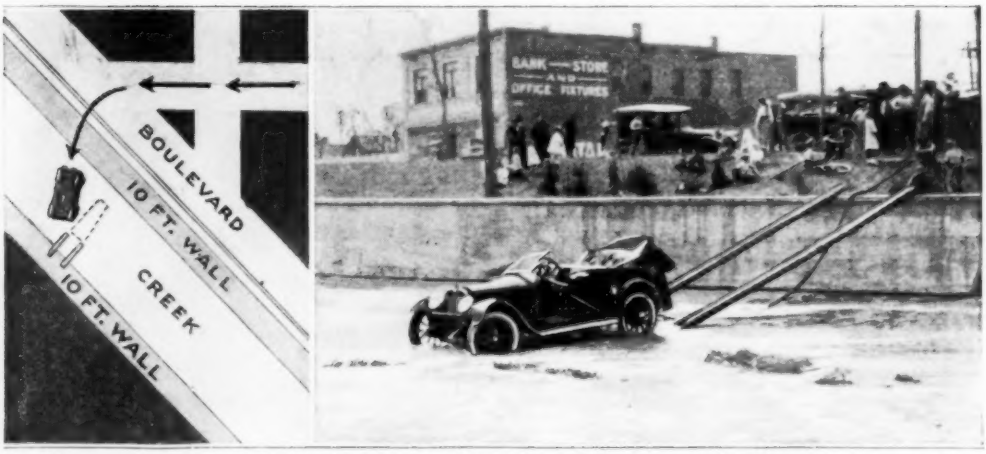
A sewer pipe which extends into the ocean at San Francisco has finally been laid in place, after two attempts at short-cut installing methods had failed. The long pipe was first laid out on the beach, above high water, resting on heavy timber



Above Are Two Views of Unsuccessful Experiments in Laying Sewer Pipe Out into the Ocean. The Long, Serpentine Curve of the Pipe Stretched Out on the Beach Indicates the Destructive Power of Storm and High Tide. The Small Picture in the Corner Shows the Method of Buoying the Finished Pipe with Barrels, but When It was Launched, the Sea Tore the Floats Loose and the Pipe Sank



The Pipes, with Floats Attached, were Moved Along into the Sea as Soon as Calking was Finished, and Then Another Section Rolled into Position; but the Method Proved a Failure. The Successful System Finally Adopted was to Build Piling the Whole Length of the Course, and Lower the Sewer from It by Cables, as Indicated in the Corner Picture



In the Diagram is Shown the Path Taken by the Automobile Which Jumped off a 10-Foot Concrete Retaining Wall, Turned a Somersault, and Landed, Top Down, in the Creek Below. How the Car Looked Afterward may be Seen in the Picture. Miraculously, the Three Occupants Escaped Injury

skids and cradles. Before the finished sewer could be launched and floated to its place, a severe storm and high seas threw it into useless serpentine curves. Next the pipe was formed on inclined skids, buoyed with barrels, and rolled into the sea; but the waves tore the floats off, and it sank.

The successful method employed piling driven along the location line, from which the pipe was suspended in loops of cable. After calking, the loops were lowered carefully until the drain rested on the bottom, and then withdrawn.

AUTO TURNS SOMERSAULT WHICH ENDS IN CREEK

Noted for being the scene of many mishaps, a shallow creek that flows through a western city probably never before was involved in as spectacular and unusual an accident as when the car shown in the picture plunged into the water. The dive came as the climax to a speedy run down a street which ends just short of the bank of the stream. Dodging a tree and a lamp-post, the machine plunged over the 10-ft. concrete retaining wall, turned a somersault, and landed upside down in the water. Three occupants escaped with slight bruises. Later the car, considerably damaged, was hauled out of the creek on inclined timbers.

MULES PUSH HAY RAKE BEFORE THEM

A hay rake that is worked in a different way has 12 long wooden prongs tipped with steel points. Two mules are hitched to the back axle, on which is the driver's seat and the lever for raising and lowering the rake. The machine is pushed toward the piles of hay, which it scoops up till it holds six or seven. It is then driven across the field to the baler, and the hay is slipped off the rake.

"Putting the Cart before the Horse" Is the Proper Method with This Hay Rake, Which Two Mules, Instead of Pulling, Push Right into the Stack. With a Lever the Driver Then Picks Up a Load. The Rake is Seen Empty at the Left and Loaded at the Right

COMMENT AND REVIEW

[These pages were printed June 21, 1919]

NOT all the heroes fell in battle with its bursting shells and deadly gas, and the excitement and pyrotechnics of combat; there were, and will be, hundreds, perhaps thousands, who just as willingly gave their lives, but whose sacrifice is not printed in any list, nor written in halls of fame.

Unsung Heroes

When we entered the war and there was work for everybody, many a man who had practically retired from active business, but whose ripe experience was golden, took up executive duties. Some were called away from home; others continued what they had been doing, but took on burdens far beyond their years. Into this work they threw themselves without reserve, and in a year exhausted that vitality which otherwise would have yielded them ten years more of life. Others were in the prime of life, but in positions of such great importance as to require the normal efforts of five years to be expended in one.

The war is over, the strain has relaxed, but in this city and that appear at frequent intervals the names of those who are passing away, whose lives are part of the price of war. Sanitariums for people with overstrained nerves are filled as never before, many of whom will feel the effects of war-time efforts in lessened efficiency and shortened lives. Together with those who lost lives, or limbs, or health in military service, these also deserve the appreciation of their countrymen.

WHILE our crops in the North can almost be seen to grow, and the golden grain fields of the South are already being gathered; while industry is putting on more men and adding to its facilities; while indications promise a period of greater prosperity than any nation has ever known, we should not, in our expected success, forget the conditions which exist across the Atlantic. We have no occasion to be pessimistic—far from it—but we do need to understand conditions there, even though the picture is a painful one.

Over There and Here

Frank Vanderlip, a banker of international experience, and a close observer, on his recent return from a study of affairs abroad, designates conditions there as "paralyzed industry," and paralyzed to an extent little dreamed of by most of us here.

Europe lacks capital, raw materials, and to a large extent industrial organization, all of which have been used up, or scattered during the war. Resumption of industries is also hindered through the loss by death of millions of skilled and experienced men, whose abilities required years to grow, and which only time can restore. Only partial crops will be raised there this year, and live stock of all kinds has been greatly depleted; fortunately our own and Canada's grain crops promise a huge yield, and with restored ocean traffic starvation conditions are improbable, but the full dinner pail is unlikely there for another year. It is to America that Europe must look for relief, and it is for us to keep a level head, both for Europe's sake and our own. This country has the opportunity of centuries to be of world-wide assistance in stabilizing and restoring normal conditions, and we must not fail in our duty, nor must we think only of ourselves.

The Financial World reduces the whole proposition to these few words: "Capital must be husbanded, long credits extended, labor must not be impatient or dictatorial, and capital must not make greed its first principle. Europe is economically diseased and must be treated with tenderness and care." We have our industrial organizations but slightly impaired; our machinery is in good working condition, being neither junk nor obsolete; we have raw materials; we have the money to operate and produce, and we have millions of skilled and unskilled laborers. What we most need at this moment is a spirit of reasonableness and coöperation on the part of both employer and employe in order to stabilize producing and working conditions. This alone can secure the largest permanent returns to both. The occasional employer who refuses to get down to earth and sit in with his men to discuss matters fully, in an honest heart-to-heart effort to get matters right, is just as unreasonable and illogical as the sympathetic strike which takes thousands of men from jobs that are satisfactory, in

order to force the observance of some technical point between one employer and a few score or a few hundred of his men. Not all employers in these days are intolerant czars and tyrants. Those who are will, by their own stubbornness, count themselves out before long, and will have to make way for men who believe in and practice a spirit of fair-mindedness. But the many who are human surely deserve the consideration and coöperation of their men. One thing is absolutely certain: The advocates of Bolshevistic and I. W. W. principles only throw monkey wrenches in the gears, and can never get their followers anywhere but into trouble. Even though they sincerely believe in what they advocate, they are like a packing-house butcher trying to perform a delicate operation on a man's eye; he means well enough, but the patient is pretty certain to lose his sight.

Adopt Metric System

IN the early part of the 13th century the Hanseatic League, which was a business organization of German towns and merchants, extended its sphere into England. These merchants brought with them a system of weights and measures which has endured until the present time, and was brought to America from England, and adopted and used here ever since. For several hundred years the Germans controlled business in England, and it remained for a woman—Queen Elizabeth—to rid the country of their dominance.

In 1783, that great British inventor, James Watt, realizing how irrational was the method then in use, devised a decimal system, which he submitted to several countries. It was this system which became the present metric system. Talleyrand, the great French statesman, was quick to realize its advantages and caused it to be adopted by France. Thirty-three other countries soon adopted it also, and today, in whole or part, the metric system is in use in 200 countries. Among them may be mentioned Arabia, Archangel, Abyssinia, Babylonia, Egypt, Finland, Iceland, India, Korea, Monte Carlo, Mozambique, Palestine, Patagonia, Siberia, Sahara, Siam, Turkey, and Zambesia. China, which for years has used the metric system in 28 ports, has recently decided to extend the system to its 426,000,000 subjects. In fact, the United States and Great Britain are the only remaining countries of consequence which have not adopted it.

The Arabic numerals, 1234567890, are used throughout the world. The advantage of a world-wide use of a uniform system of weights and measures is self-evident. Indeed, one of the first things our soldiers (most of them) had to learn, on arrival in France, was the metric system. To the use of this accurate, simple system is doubtless due, in a large degree, the efficiency in production and use of the German war machine. The chief cause of difficulty in making and rejection of shells by our munition makers in 1914 and 1915 was due to our workmen who, having been trained in inches, were making ammunition in inches to be used in allied guns made in millimeters. The process today of making export goods in inches and feet, to be sold in countries where the dimensions must first be translated into centimeters and meters is so laborious and confusing and, finally, uncertain, as to work a great handicap on our sales abroad. To meet this disadvantage, our exporters are obliged to translate their dimensions into metric denominations, but even this cannot always be done with absolute exactness. If we are to attain our possibilities in foreign markets, it is of paramount importance that we go to the modern system as soon as possible.

To change any custom which has had universal use in a country for centuries seems revolutionary, and suggests all sorts of difficult problems. We like our inches and feet just as the native in some lands today likes his antiquated wooden plow which has the sentiment of centuries of use. In some of our older cities, certain streets wind about, resulting in buildings of irregular and undesirable shapes, because years ago a cow path followed the direction of least resistance. Some of these freak streets have already been corrected, and no new ones are laid out so. Our present system has no better excuse for being continued, and should be changed. Any person of ordinary intelligence can learn the metric system in an hour, and school children will master it in a fraction of the time now required to learn the present tables.

From time to time the project has received public attention, and is now being urged by the World Trade Club of San Francisco, in a logical and convincing campaign. Our readers will find the booklet issued by the club well worth reading.

With a closer working understanding of mutual interests than ever before, the present surely offers a most favorable time for Great Britain and this country to get in step with the rest of the world in this important matter.

THERE are some things which those who lay any claims to manhood, in every country in the world, scorn to do. This is true not only in civilized countries, but likewise among savages. Their code of honor forbids their doing certain things, and a savage would unhesitatingly yield his life rather than so demean himself. In fact, savages are apt to have terrible forms of execution for such offenders.

The Language of Bombs

Except for purposes of open and declared warfare, the bomb has no excuse in any civilized country. Even in warfare the bomb has definite limitations, and the Huns cannot in a century live down their resort to bombs dropped on enemy ambulances, hospitals, and civilian towns and districts. Of all the cowardly, unmanly, dastardly means of attack or revenge, the bomb in the hands of the civilian heads the list. It even lacks the qualities of a knife stab in the back, contemptible as that is, for that is directed against only one, who may by chance have given some personal offense to the assassin; but the bomb in its effort to reach the chosen mark as often kills or injures innocent women and children or the casual passer-by. It is placed entirely without regard to consequences, and in doing so the bomber puts himself outside the pale of civilized humanity. He becomes the scorpion, the gila monster, the mad dog, utterly without good purpose to mankind, whose speedy death is the only solution to the well-being of society. Captain Kidd's pirates had the courage and grace to fly the black flag, but the bomber works in secret and usually in darkness.

The recent attempt to attack society by sending deadly bombs to officials and men of affairs, should arouse state and national legislation to the passage of the most stringent laws, with the death penalty for conviction of the offense, and prison terms for those who knowingly had any part in it. This should include those who knowingly furnished parts or explosives; those who assisted in construction; those who harbored the makers, the bomb, or the bomb thrower. The penalty should be death even in states which have abolished capital punishment for murder, for there is a vast difference between what is known as a murderer and a bomber.

With all the freedom of speech in this country, tolerated even to the point of treason, there exists no possible excuse for the bomber, and when he attempts to speak in the language of the bomb, his efforts should be promptly stopped forever.

TUESDAY, June 17, was the 10th anniversary of the home-coming of the Wright brothers, Wilbur and Orville, after their epochal demonstration before the crowned heads of Europe. After failing to win any encouragement in their own country, the Wrights went to Europe, where their performances aroused the wildest enthusiasm. To say they "started something" is to put it very mildly. Germany impatiently awaiting "der Tag," and France and England, already sensing and apprehensive of the coming storm, instantly saw the tremendous possibilities of the airplane as a weapon of war. It is interesting to contemplate in what respects the war would have been differently fought, had there been only the old-time balloons—certainly it would have made a vast difference in many ways.

Ten Years in the Air

That the development of the plane has been tremendously advanced by reason of its varied service in the war is apparent; just how many years, under peace conditions, would have been required to bring the art to its present stage is uncertain, but evidently it would have been quite some time. And now it is rapidly falling into line with the automobile, and soon will attract very little more attention, though an airship, like a boat, will never lose a certain individuality. As I write these words, I can hear the air mail for Cleveland, tuning up its engines preparatory for its daily flight, yet I scarcely glance out of my window, which looks down directly upon the starting and landing field in Grant Park. The first day or two, yes; but now the regularity of the thing fails to attract. At precisely 9:20 two planes come out and warm up their engines; at 9:25 the motor truck from

the post office dashes up, and its mail bags are thrown into whichever plane is to make the trip. At exactly 9:30 it takes the air, and in a few seconds is out of sight. At 12:20 to 12:30 the plane which left Cleveland at 9:30 drops down to the same spot, and its load is tossed out to a waiting motor truck. The arrival seldom varies more than five minutes, and is so regular in all its motions as no longer to offer a romantic sight, but has fallen to a prosaic commonplace, beside which the arrival of the 5:17 train in a country town is a frenzy. And each week the crowd which gathers to witness the departure and arrival grows smaller. Thus quickly do we pass from thrills to thoughtlessness.

That the commercial uses of the plane are being rapidly developed is evident, hastened also by the sale of army planes by the Canadian and our own government. Already express deliveries are being advertised; daily papers are delivering their editions to readers 50 miles distant as soon as to those a few blocks away; woodsmen find they can cruise more timber in a day than formerly in a month on foot; ranchmen, miners, forest rangers, all are discovering a great timesaver, and a path through the air where none exists on foot. A cañon which formerly required several days to cross on horseback can be ferried through the air in ten minutes; the arctic regions witness the sudden removal of their age-long barriers; the desert no longer burns the foot and parches the throat of the traveler; the jungle can be passed over as one steps across a brook; the most remote and inaccessible places in the world unfold their pages, which since the dawn of creation have been a sealed book. All these and many more utilities lie practically within our grasp today, and all these possibilities have opened to our reach in ten years.

Most surely the development of the next ten years will unfold some startling accomplishments. What an age in which to be living!

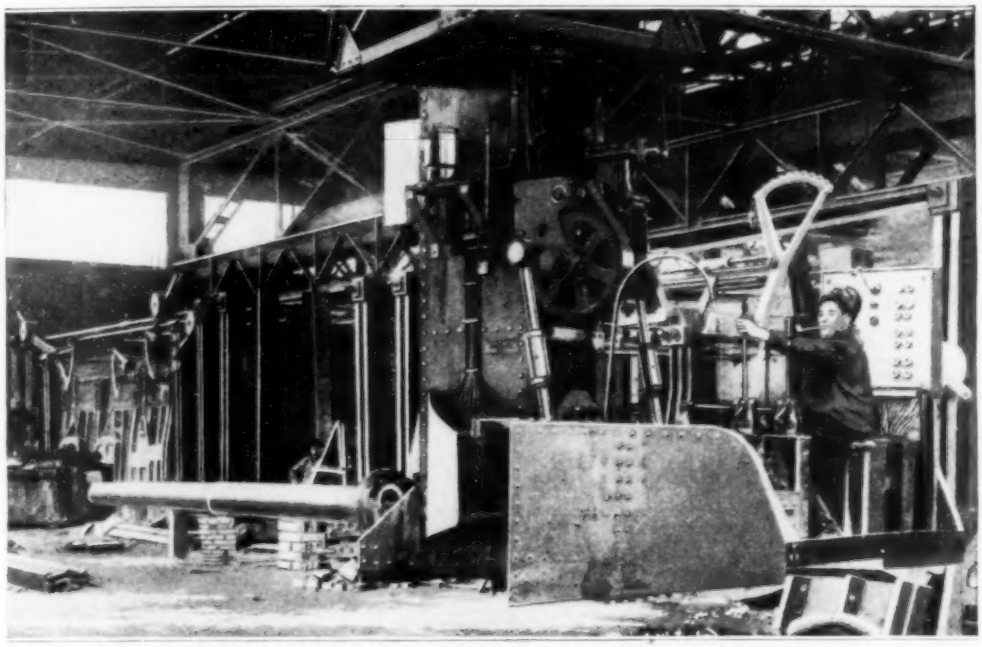
Plane or Dirigible

THE Atlantic Ocean has now been crossed in a single flight of a heavier-than-air machine. Capt. John Alcock and Lieut. Arthur W. Brown, of the British army, made the passage from Newfoundland to Ireland in 16 hours. Coming so closely on the performance of our own naval effort, the attempt was rather counted on as a success, which partly deprived the gallant airmen of that full measure of public credit which is rightfully theirs. The two air voyages both confirm the possibility of ocean passage and emphasize those features which remain to be worked out before a dependable and reasonably safe service can be counted on. The trail has been twice blazed, however, if a voyage of 2,000 miles through fog can be said to mark a path, and the experiences of the crews provide a basis of incalculable value. As suggested in these pages last month, the ultimate trans-ocean passenger airship will be quite different from those now in use. As Captain Alcock says: "Our flight has shown that the Atlantic flight is practicable, but I think it should be done, not with an airplane or seaplane, but with flying boats."

Some still insist the dirigible will be the type of long-distance passenger ship, in spite of its great bulk, and unwieldiness when anchored in a high wind. Obviously a huge dirigible cannot hold its own against a severe gale, but neither can an airplane make much, if any, progress, and even big ships are at times forced to come about and run before the wind. It is, however, conceivable that the airship, of whatever type, might rise above the gale which the water-borne vessel cannot escape.

Before these lines can reach our readers, the English dirigible "R-34" will have made its venture to cross our shores, and will succeed, it is to be hoped, in good time and without misadventure of any kind. The completion of the round-trip voyage will furnish a wealth of experience, as a result of which experts on air craft will doubtless be able to decide which type of airship gives the greater promise of permanent adoption. It is in a sense the parting of the ways in which the plane and the dirigible are on trial. This, however, chiefly as a trans-ocean vessel, for the plane has its own exclusive possibilities for certain overland purposes, which the lighter-than-air machine can scarcely hope ever to serve. Each has its distinctive advantages: The plane is much faster, and the dirigible can remain above the water while repairing its engines. The over-sea trip of the English dirigible will mark a big page in the world's history of the air.

H. H. WINDSOR



This Huge Electrically Driven Charging Machine Travels before the Open-Hearth Furnaces in a German Foundry, Handling Charging Boxes, Seen at the Extreme Left, Filled with Shell Cases to be Melted into Ingots for the Manufacture of Rails and Other Peaceful Commodities

GERMANY IS MAKING SHELL CASES INTO PIG IRON

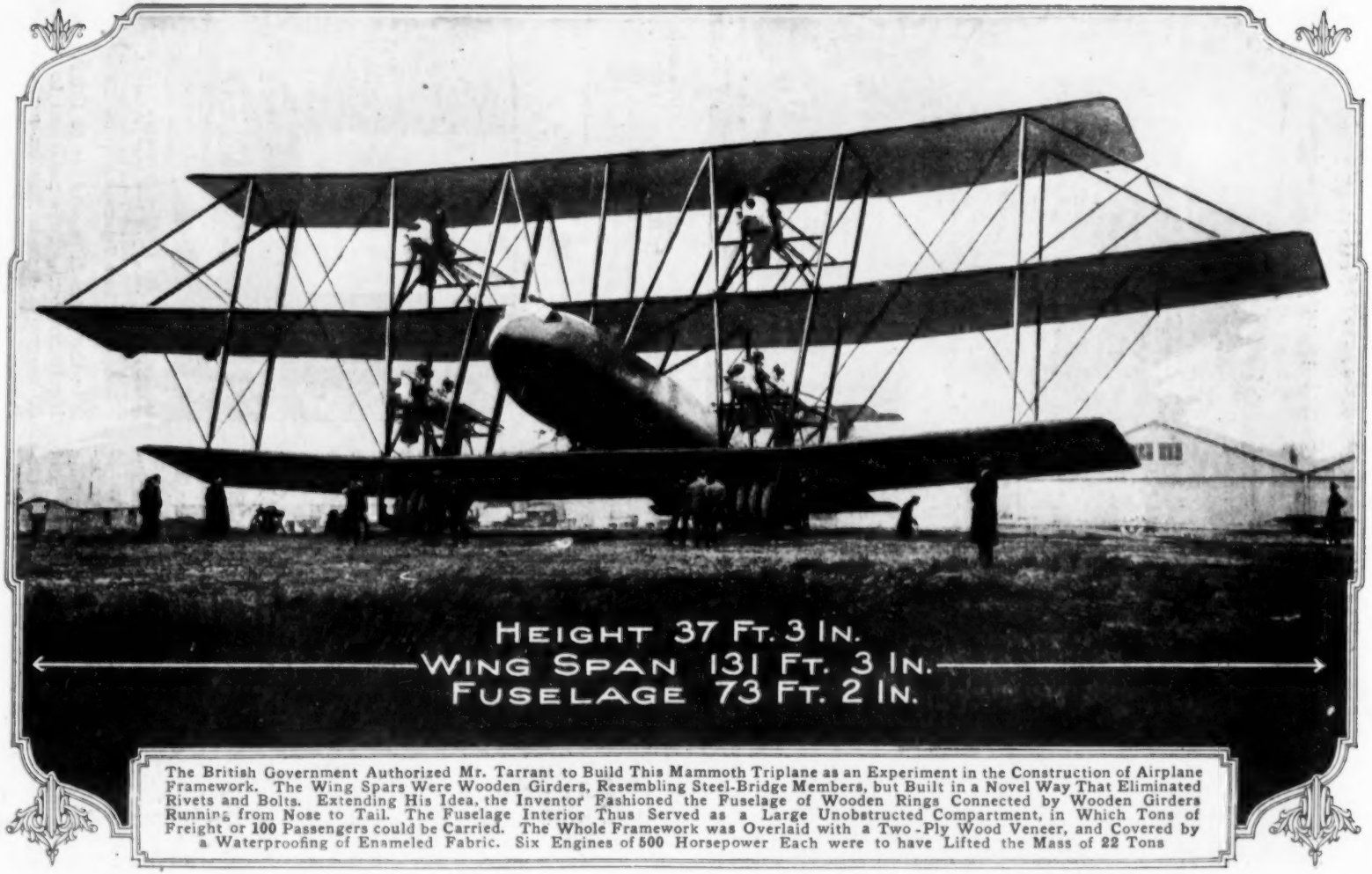
As rapidly as possible, all the unused shells in Germany are being converted into commodities more useful to peace-time pursuits. The procedure, carried out under orders from the allies, is to extract the explosive, remove the copper rotating bands, and then turn the empty cases over to the foundry. There they are melted up by the open-hearth process. A huge electrically driven charging machine picks up a charging box full of cases, carries it on the end of a beam to the furnace, thrusts it in and dumps the box by inverting it. Cast into ingots, the steel is then sent to the rolling mill.

TELEPHONE CALLS RECORDED BY TELEGRAPHIC DEVICE

When leaving the office or home for a few hours one will not have to wonder, upon returning, whether the telephone has rung during his absence, if the instrument is equipped with a recently invented device for recording calls and other information. Briefly, this is a telegraphic receiving machine, printing dots and dashes on tape, compactly built and fastened to the base of the telephone. When an operator finds that she cannot get an answer to her signal, she reports the fact, and any message the caller may desire is delivered to a telegrapher, who transmits

An Instrument for Leaving Messages with an Unanswered Telephone Call has been Invented. Dots and Dashes are Printed on Tape by the Device, Which is Operated by a Telegrapher at the Exchange

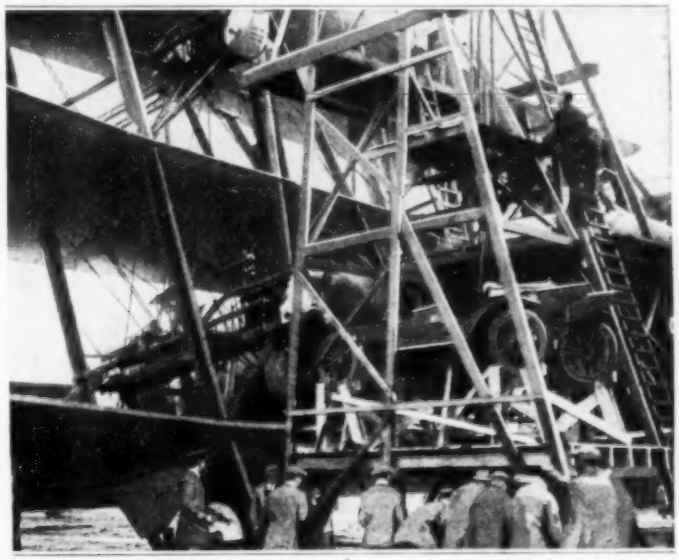
it in the regulation manner to the recording instrument. Tape sufficient to record 60 messages may be put on a reel which is part of the device.



The British Government Authorized Mr. Tarrant to Build This Mammoth Triplane as an Experiment in the Construction of Airplane Framework. The Wing Spars Were Wooden Girders, Resembling Steel-Bridge Members, but Built in a Novel Way That Eliminated Rivets and Bolts. Extending His Idea, the Inventor Fashioned the Fuselage of Wooden Rings Connected by Wooden Girders Running from Nose to Tail. The Fuselage Interior Thus Served as a Large Unobstructed Compartment, in Which Tons of Freight or 100 Passengers could be Carried. The Whole Framework was Overlaid with a Two-Ply Wood Veneer, and Covered by a Waterproofing of Enameled Fabric. Six Engines of 500 Horsepower Each were to have Lifted the Mass of 22 Tons

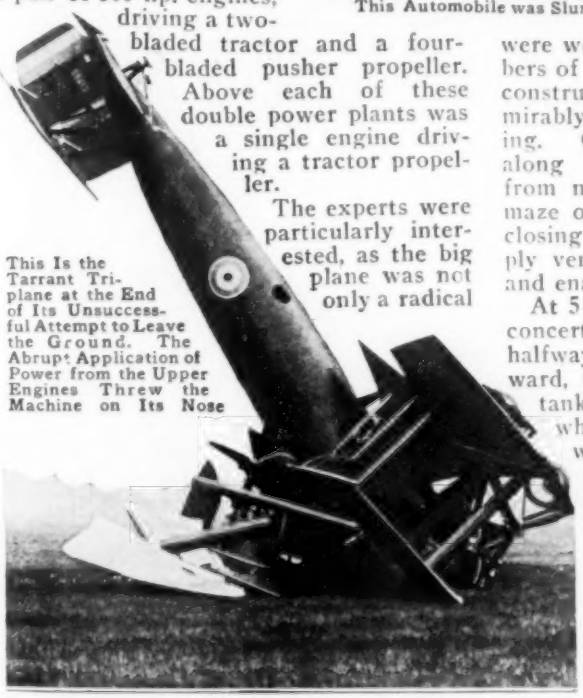
LARGEST AIRPLANE CRASHES IN TRIAL FLIGHT

AT daybreak of a recent Monday morning, Mr. Tarrant, his aides, and a number of government experts assembled at Farnborough aerodrome, England, before the balloon shed which had housed the Tarrant triplane during the 13 months of its construction. It was rolled out on the tracks prepared for this, its trial flight. Dwarfing everything in the vicinity, it stood 37 ft. 3 in. high. Top and bottom planes measured 98 ft. 5 in. in span; the larger middle plane, upon which the ailerons were hinged, measuring 131 ft. 3 in. Between middle and bottom planes was secured the cigar-shaped fuselage, stretching 73 ft. 2 in. from the blunt nose to the biplane tail at the rear. On either side of the fuselage was a pair of 500-hp. engines, driving a two-bladed tractor and a four-bladed pusher propeller. Above each of these double power plants was a single engine driving a tractor propeller.



As the Two Upper Engines of the Tarrant Triplane Were Approximately 28 Feet from the Ground, It Was Impossible to Crank Them Until This Automobile was Slung in the Staging and Used as a Starter

The experts were particularly interested, as the big plane was not only a radical departure from accepted standards of design, but was in many ways, an experiment in the use of wood for airplane construction. The spars which formed the backbones of the great wings were wooden girders, similar to the members of a steel bridge. By using the same construction, the fuselage was suited admirably for freight and passenger carrying. Circular "girders" were strung along longitudinal girders which ran from nose to tail, eliminating the usual maze of diagonal wires and braces. Inclosing all, was the skin of molded, two-ply veneer, covered with fabric, varnish, and enamel.

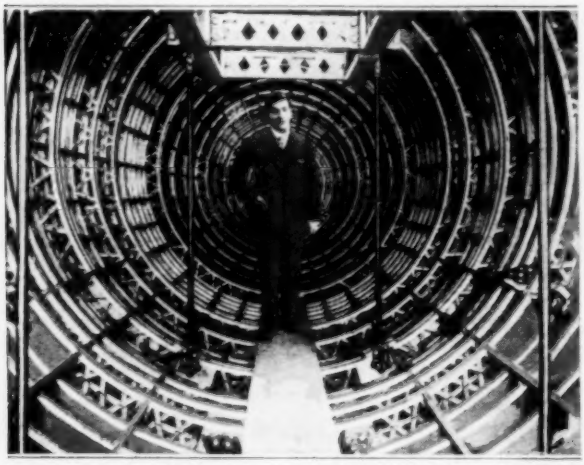


This Is the Tarrant Triplane at the End of Its Unsuccessful Attempt to Leave the Ground. The Abrupt Application of Power from the Upper Engines Threw the Machine on Its Nose

At 5:30 a. m., the six engines tuned to concert pitch, the crew entered the door halfway down the fuselage. Walking forward, they passed between the gasoline tanks to the engineers' compartment, where all engine controls and gauges were ranged on a bulkhead. The two engineers took their seats, while the pilots climbed up a short ladder, through the bulkhead, and into their cockpit in the very nose of the fuselage. Here they took their stations in comfortable wicker chairs, before the twin controls.

Speeding up only the four lower motors, they felt the towering triplane move out under its own power for the first time.

Despite its enormous weight, it taxied swiftly over the ground. Satisfied with this, they decided to take it into the air at once. Opening up the two last throttles, the upper engines took hold, and upset the whole top-heavy mass. The tail described a wide arc as the nose crashed its way six feet into the soil, killing one pilot, injuring the other, and completely ruining the fore part of the machine. Regret is general that the peculiar girder construction was not tried on a machine of less radical design.

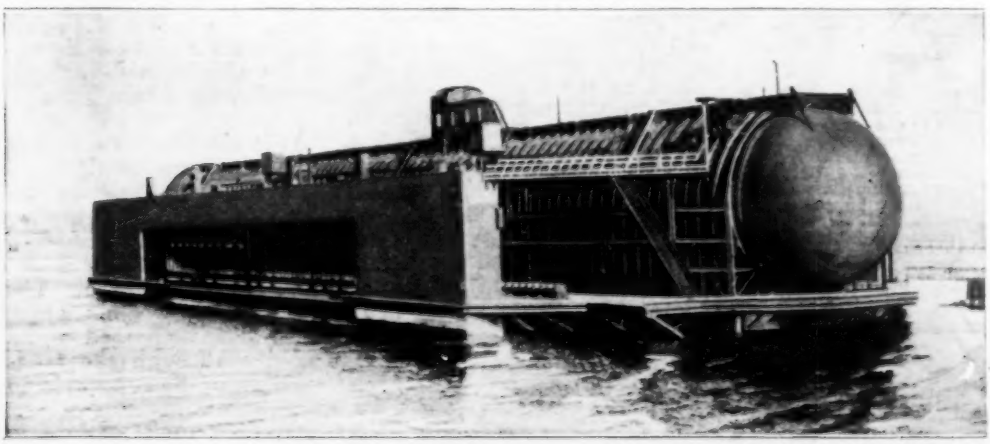


This Interior View of the Tarrant Fuselage Shows How the Rings were Secured at Intervals along the Wooden Girders. Its Rigidity was Proved in the Fatal Trial Flight

CRYSTALS REPLACE BATTERIES IN TELEPHONE CIRCUITS

The phenomena of "piezo" (or pressure) electricity have been recognized for years, but interest has lagged until the recent disclosure of experiments made by a research engineer in the employ of an electrical concern. It has been known that pressure applied to a crystal in a certain way results, like a change in temperature, in developing positive and negative electricity on opposite ends of the little mass. With only a single distortion this electric energy is quickly dissipated; but by alternating high and low pressures with great rapidity a considerable electrical effect is obtained.

It occurred to this engineer that the vibrations of the human voice or of a musical instrument were ideally qualified to produce high-frequency distortion. As an experiment he mounted a phonograph needle in a crystal of the familiar Rochelle salt. Holding the needle on a rotating record the vibrations generated enough electricity to operate a number of receivers mounted in series. From this it was but a step to substituting the crystals for dry-cell batteries in telephone circuits, as a means of transmitting and amplifying sound.



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DRY DOCK WITH HUGE TANK USED FOR TESTING GERMAN SUBMARINES

BATTLE-SCARRED submarines of the German navy undoubtedly spent much of their time "in the shop" during the last months of the war, and elaborate equipment was provided for their repair and testing. The method of test was to inclose the sub bodily in a tube, into which, when the entrance had been sealed, water was pumped at pressures corresponding to all depths of submergence. A giant tubular tank of this sort, combined with a dry dock for repair work, was located at the north end of the Kiel Canal, and forms the subject of this picture.

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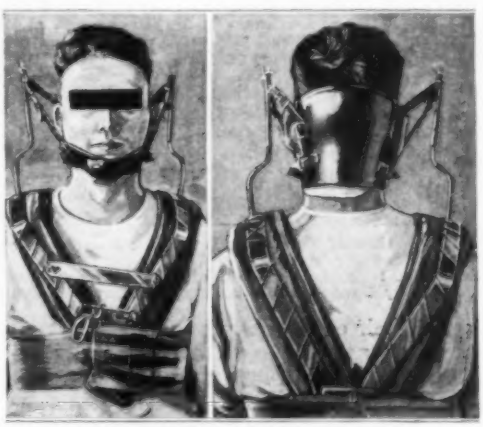
Parades That Included as Features Such Curiosities as Gigantic Animated Cans of Tooth Paste, and Huge Perambulating Padlocks, Marked the First Leipsic Fair Since 1914, and Seem to Indicate that German Merchants are Still Looking for Business, in Spite of Their Wails of Distress

NOVEL ADVERTISING MARKS LEIPSIC FAIR

The Leipsic fair was held this year for the first time since the war started. This would seem to demonstrate that Germany is neither helpless nor down and out. During the fair manufacturers advertised their goods by many novel devices which were exhibited in the processions calling attention to the celebration. A Nurnberg lock maker had men bearing great padlocks, while a tooth-paste dealer used gigantic samples to call attention to his wares.

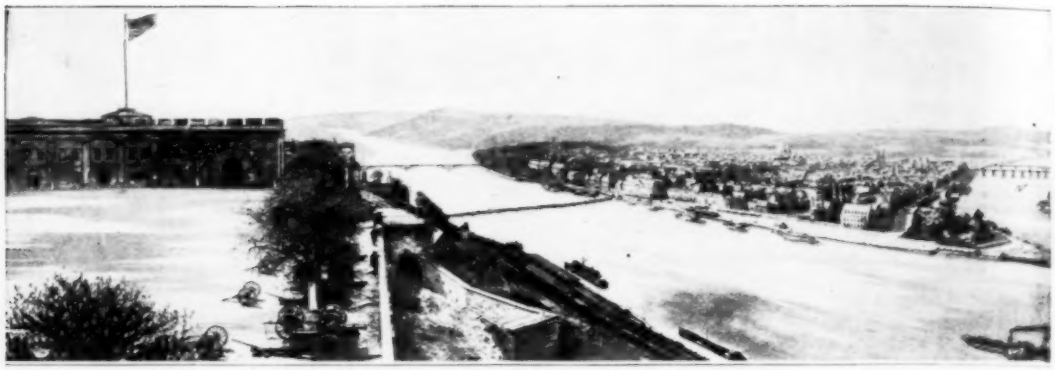
AIRMAN'S BROKEN NECK CURED BY IMPROVISED APPARATUS

How an American army flier, whose neck was broken by a fall, recovered and reëntered the service, was briefly told in Popular Mechanics last March. Now that a permanent cure has been effected, the apparatus that accomplished so extraordinary a result is disclosed. Devised for the occasion by the army surgeon in charge of the case, it took the form of a rigid support for the patient's head, with adjustments which kept the neck sufficiently stretched to separate the injured vertebræ. A sole-leather pad for chin and neck was made from a plaster cast. A metal yoke fitted to the shoulders was inclosed in leather pads held rigidly in place by a firm body harness. To the metal yoke were soldered upright rods of metal, extending well up toward the top of the head, and the neck pad was strapped to the tips of these rods. Wing nuts at this point were screwed up to greater tension each day, until the patient's head resumed its normal attitude. Oil massage was used, but the support was never removed until X-ray exposures indicated complete restoration. Seven months after his fall, and three months after this special treatment commenced, the injured officer successfully passed the air-service examinations again.



BY COURTESY OF THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

Front and Back Views of the Ingenious Harness That Cured an Airman's Broken Neck and Restored Him to the Service: The Head was Held Rigid by Leather Pads Strapped to Iron Uprights, Which were Soldered to a Metal Yoke on the Patient's Shoulders, a Body Harness Keeping It in Place



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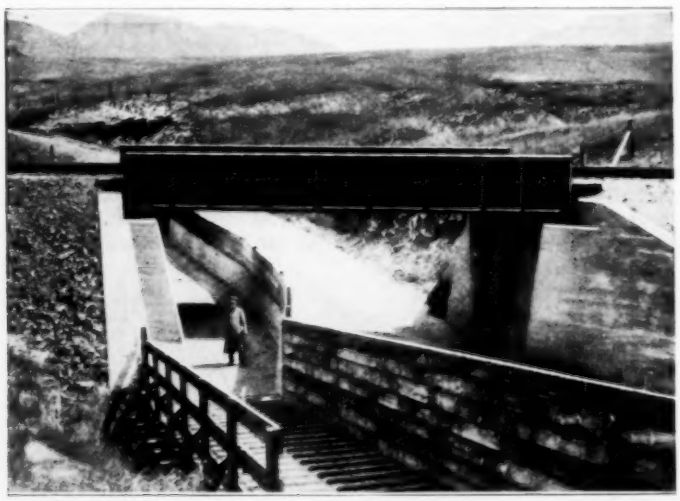
The Soldier of the American Army of Occupation is Rewarded for a Climb to the Citadel of Ehrenbreitstein by the Farther Bank Broken by the Mouth of the Mosel, and in the Angle Formed by the Intersection of

SUBWAY FOR LIVE STOCK STOPS CATTLE KILLING BY TRAINS

A grade crossing, where for years farmers suffered heavy losses through the killing of their cattle, has just been eliminated by the construction of a steel and concrete viaduct. When the highway was put under the railroad the farmers suggested to the highway commission that the new road be designed for both regular traffic and live stock. Accordingly a six-foot strip under the viaduct was set aside by a concrete abutment that divides the road. Upon this a wooden chute was built with cross cleats of wood to assure the cattle a safe foothold, and no live stock gets killed now.



The Left Half of the Subway, under a New Steel and Concrete Viaduct, is Intended for the Use of Cattle; the Runway Is Six Feet Wide, Separated from the Highway by a Concrete Wall, and Floored with Wood. Many Cattle were Formerly Killed at This Dangerous Crossing

MINE LABORATORY TO OPEN WITH RESCUE CONTESTS

Miners from all parts of the United States are expected to take part in contests in rescue work and first aid to the injured drill, which will form part of the dedicatory ceremonies that will mark the opening of the new laboratories and workshops of the Bureau of Mines, at Pittsburgh, Pa., during the latter part of September. Cups and medals will be awarded the winning teams, while souvenirs, in the form of badges and banners, will be given all who take part in the contests. At the last safety-first meet, in 1911, there were 18,000 miners present, and more are expected at this year's affair. Another feature of the dedication will be the staging of an actual coal-dust explosion in the experimental mine of the bureau, 13 miles from Pittsburgh. The new laboratories and workshops cost nearly one million dollars.

AMERICAN FLAG FLIES HIGH ABOVE COBLENZ

The American flag is the last of many conquering flags to float from the battlements of Ehrenbreitstein, the towering citadel which dominates the city of Coblenz. From the ramparts of that "im-

FROM UNDERWOOD & UNDERWOOD

This Sweeping Panorama. He Sees beneath Him the German Rhine in Sparkling Progress Northward to the Sea; the Two Rivers the Colossal Statue of William I, His Regal Back Turned on the Old City of Coblenz

pregnable" fortress the American doughboy looks down on the Rhine and Mosel rivers as they flow together; looks down, too, on the colossal equestrian statue of William I, grandfather of the last mad William. Behind the statue, in the angle formed by the confluence of the rivers, lies the city, one of the oldest in an old land. Records prove the existence of a military post at this point even at the birth of the Christian era.

WOMAN'S ALTITUDE RECORD GOES TO FRENCH AVIATRIX

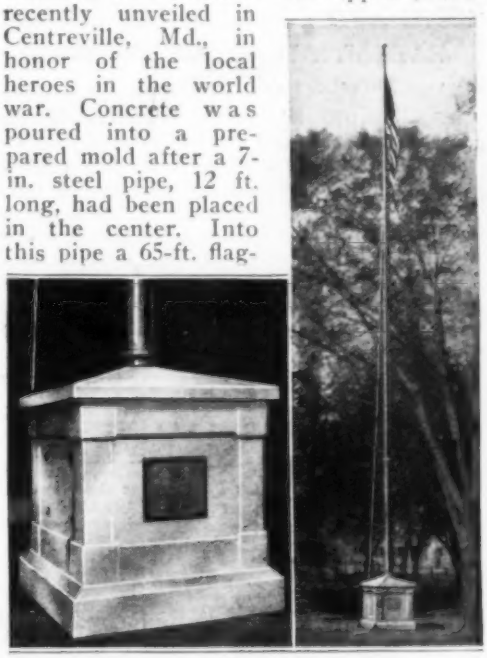
The famous French aviatrix, Baroness de la Roche, recently flew to an altitude of 15,700 ft., driving the little Caudron biplane with which the late Jules Vedrines landed on a department-store roof last January. The performance has been checked by a commission from the French Aero Club, giving the baroness the woman's altitude record. It was formerly held by Miss Ruth Law, of America, who climbed to 14,701 ft. at Peoria, Ill., in 1917.

MUNICIPAL RESTAURANT LOWERS LIVING COST

High prices in the eating places of Brest, France, caused the city authorities to open a municipal restaurant especially for working people who find it necessary to eat one or more meals each day away from their homes. A public building was remodeled, and tables sufficient to seat 160 persons were placed in it. Meals in the restaurant cost approximately 43 cents, and include soup, meat, fish or eggs, one vegetable, dessert, and a quantity of either wine or beer. Regular salaries are paid all employes except the waitresses, who receive about two cents for each meal served. Tipping is not allowed.

NEW MONUMENT CONSTRUCTION THAT SAVES EXPENSE

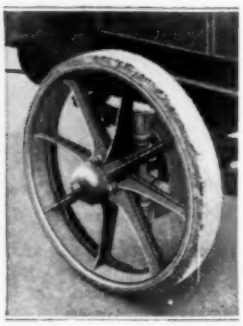
A monument, in the construction of which a new method was applied, was recently unveiled in Centreville, Md., in honor of the local heroes in the world war. Concrete was poured into a prepared mold after a 7-in. steel pipe, 12 ft. long, had been placed in the center. Into this pipe a 65-ft. flagpole was placed. A white stucco finish gave the monument the desired effect.



Effective Monument of Poured Concrete with White Stucco Finish: An Iron Pipe, Cast In, Holds a Flagpole, with the Effect Seen at the Right

MILEAGE RECORD ESTABLISHED BY SOLID BUS TIRE

Tire-mileage records have kept pace with growth of the automobile industry, and the latest tire figures would have been unbelievable a few years ago. A solid tire recently was retired after serving for 100,123 miles on the left front wheel of a New York omnibus. This tire, 34 by 5 in., was put on the wheel May 20, 1916, and taken off March 6, 1919. When removed, it was 1 3/16 in. high, with 7/16 in. of tread rubber left. During the nearly three years of service, the tread had worn down 1 11/16 in., which is at the rate of about one inch to every 59,332 miles of travel. The makers of the tire believe this establishes a record.



NINE AND FOURTEEN-CYLINDER RADIAL AIRPLANE ENGINES

An English manufacturer has succeeded in producing efficient airplane engines of the radial type, and offers two models, one with nine and the other with 14 cylinders. In the first, the nine cylinders, arranged in a circle, work on a single-throw crankshaft through a master connecting rod. Three carburetors on the crank-case cover feed their mixture into an annular chamber, in which a spiral aluminum casting of ingenious design distributes it to the cylinders in correct order. The 14-cylinder model is arranged in two circular rows of seven, acting directly on a two-throw crankshaft, each crank carrying seven connecting-rod heads. The carburetors supply a circular chamber, from which individual pipes lead to each cylinder. This model is 3 ft. 5 5/8 in. in diameter, weighs complete 582 lb., and develops 315 to 347 hp. at 1,800 to 2,000 r.p.m. The cylinders are 4 3/8 by 5 13/16 in. The nine-cylinder model, with cylinders 5 3/4 by 7 1/2 in., develops 450 to 500 hp. and weighs 662 lb. complete.

"SEVENTEEN-YEAR LOCUST" IS INTERESTING VISITOR

Some of those who are unwillingly entertaining the "17-year locusts" this season, on their first visit since 1902, are not a little puzzled by the mystery of a disappearance that persists for half a human generation, and yet ends with such precision. The fact is that the insect's visible stage is really the final flash of a long career, nearly all of which is spent underground. This summer the female cicadas will lay their eggs on the limbs of trees, and in a few weeks the young will hatch, fall to the ground, and immediately burrow into it. At subterranean depths as great as 20 ft., these larvæ will pass the years, feeding upon roots and gradually changing to the pupa form. In 1936 the fully developed pupas will come out of the ground almost at the spot where the larvæ went in, and from them will emerge the adult, winged cicadas, ready to start another cycle to end in 1953. Another family of cicadas, with a 13-year cycle, is visiting in the South this season.

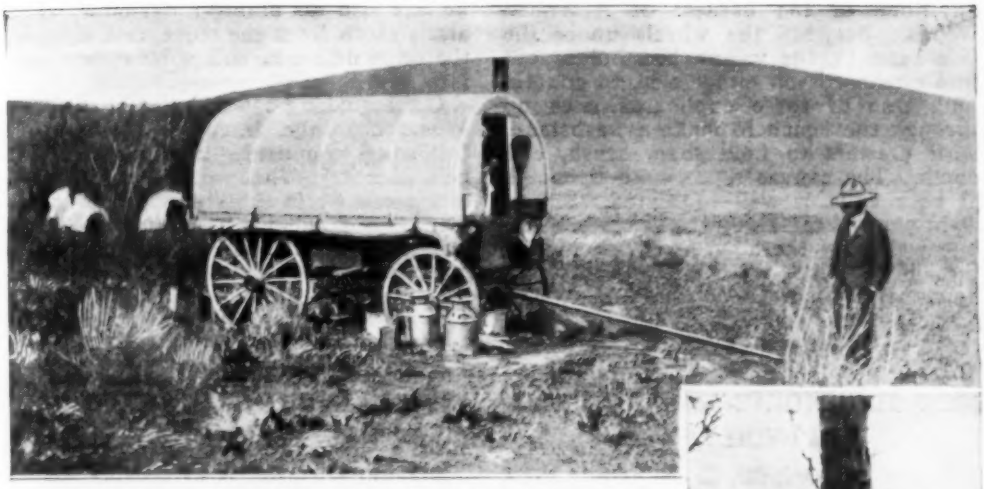
At the Right Is the Spiral-Fluted Aluminum Casting Which Fits into the Circular Induction Chamber, to Act as a Gas Distributor to the Cylinders

BY COURTESY OF THE AEROPLANE

The 14-Cylinder "Mercury," at the Left, and the 9-Cylinder "Jupiter," at the Right, Are English Specimens of the Stationary Radial Airplane Engine. Both are Shown in Rear View. Fixed to the "Jupiter" will be Seen the Three Carburetors, Each of Which Feeds Three Cylinders. One Carburetor may Thus Go Bad without Stopping the Engine. In the Lower Center is Shown the "Jupiter's" Back-Cover Unit

A SHEEP HERDER'S HOME

By FRANK R. ARNOLD



The Sheep Herder's Traveling Home Has Three Coverings of Canvas, for Warmth; Benches along Both Sides; a Stove Fastened to the Floor at the Front, and a Bedroom in the Back; There Are Also a Washstand and Plenty of Bins and Cupboards for Supplies

JUST at present the sheep herder's lot is a fairly happy one. He gets $100 a month besides his expenses, and one never can see his sheep wagon without wanting to leave civilization for a few months and take to the range. It is the most compact dwelling house on wheels that has ever been devised. For utilizing all possible space it can give lessons even to a dining car or a sailboat. It is dining car and sleeping car in one, and historically forms a permanent link between western pioneer days, when everyone traveled in a prairie schooner, and automobile days when the sheep wagon is used only to follow the herd during the winter and spring, until it disappears up on the high summer range where only a saddle horse can penetrate.

On the Summer Range, High above Wagon-Road Level, the Herder has to Resort to a Tent. On the Tree at the Right Some Herder has Carved His Opinion of the Life

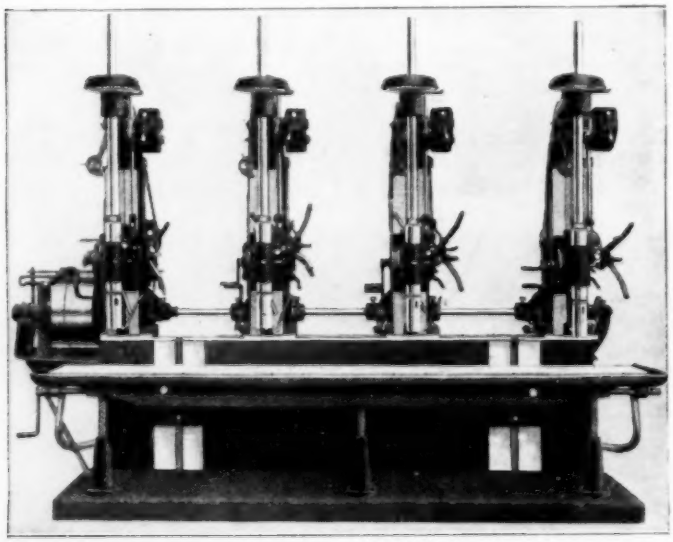
The wagon, which for months is thus the home of two sheep herders, has a long, narrow body, to give freedom to the wheels, but above the wheels it flares out enough to give a broad room with benches along both sides. It has three coverings of canvas for greater warmth in winter, and a stove screwed to the floor near the front door. The back part of the canvas-covered space serves as a bedroom containing nothing but a bed, to which air is supplied by sliding glass windows in the rear end of the wagon. Attached to the bed is a folding table, and under it are small drawers and a large bin to contain the herders' supply of flour and grain. The drawers often have neat little knobs

whittled out from the mountain mahogany, one of the hardest of American woods. Between the wheels under the side benches, the wagon box bulges out into cupboards on either side, to contain oil. One of these cupboards rises up through the bench to make a washstand, with drawers to hold soap, brush, and comb. The canvas room, with openings at both ends, is well ventilated. Six or eight persons can sit on the benches, while one works by the stove, well located by the door. Floor space is as restricted, however, as in a French kitchen, where one can stand and put his hand on anything without taking a step. The sheep herder's kitchen has the advantage that he has also his dining-room table within arm's reach from the stove, and if he lets the table down, he can immediately jump into bed.

On a quaking-asp tree, high up on the Wasatch Range, is cut in the bark the following comment, "Sheep heardin' is hell, Try it." This would seem to indicate some fly in the sheep herder's ointment. A cowboy on seeing the carved inscription remarked, "He must have been a beginner. Most of them, after three months, don't want to do anything else." The speaker was a cattleman, and such have no sympathy with sheepmen.

NEW SLIDING-HEAD GANG DRILL HAS HIGH SPEED

A new four-spindle, 26-in., sliding-head gang drill has been designed and placed on the market for heavy-duty work. This drill has a lateral adjustment that gives a spindle range from 18 in., between adjacent spindles, to 96 in., between the two outside spindles. It has eight changes of geared speeds and geared feeds on each spindle, independent of each other, and all under instant control of the operator from the front of the drill. A hand-lever reverse is provided, but an automatic reversing mechanism is also available. The machine drills up to 2 in. in steel, and will bore out cast-iron cylinders up to eight inches.



This Four-Spindle Gang Drill Gives a Spindle Range from 18 Inches between Adjacent Spindles to 96 Inches between the Two Outside Ones

STEEL IMPURITIES REVEALED BY NEW ETCHING PROCESS

A simplified process of discovering impurities in steel, by etching the surface of a section and then taking a "proof" with printer's ink, is announced by an English metallurgist. The steel need not be polished, but is simply finished with emery paper. A solution of 12 parts by weight of copper-ammonium chloride, six of strong hydrochloric acid, and 100 of water, is flowed on the horizontal surface, and kept active by frequent renewal. By starting with a neutral solution and adding the acid later, the copper deposit formed is more readily removed. When the emery marks have been etched away, the surface is inked and an impression taken in a proof press. The resulting "picture" shows the impurities as dark patches or streaks, as the acid more readily eats the purer metal. Indications of the presence of phosphorus are developed with especial clearness.

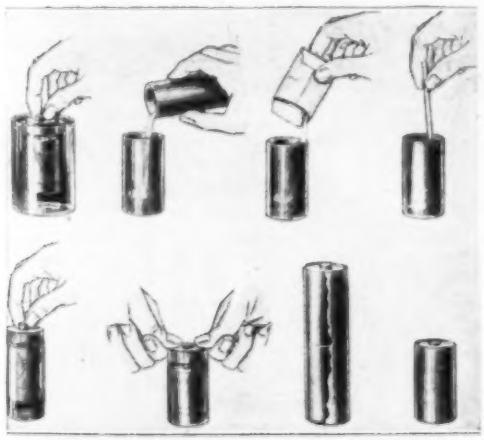
¶To be used as publicity for the Boy Scouts organization, moving pictures were made of 50 members from Akron, Ohio, on their second annual motor hike, which was taken early in the summer. These pictures will be shown all over the United States.

GERMANS CONSIDERED SODIUM FOR CARRYING CURRENT

Sodium as a conductor for electricity was considered seriously by the Germans during the latter part of the war, due to the scarcity of copper and other metals commonly used for this purpose. On the basis of weight, sodium has three times the conductivity of copper, but because of its low melting point, is difficult to use for carrying electrical currents. To overcome this drawback, the Germans proposed to use it in hollow iron tubes. An almost inexhaustible supply of sodium is declared to exist in the salt beds of Germany.

MAKE FLASH-LIGHT BATTERIES WHEN THEY ARE NEEDED

With a fresh battery, the popular electric flash light is beyond criticism. Unfortunately, the battery does not stay fresh, deteriorating even if not used. An enterprising manufacturer has taken advantage of this opportunity to put on the market an outfit for making batteries as they are needed. The outfit consists of six empty zinc cells, six carbon electrodes surrounded with depolarizer and surmounted by a cork, and materials for the electrolyte. The fluid is poured into each zinc as it is needed, a powder added, and the mixture stirred. When it congeals, the carbon is inserted and zinc

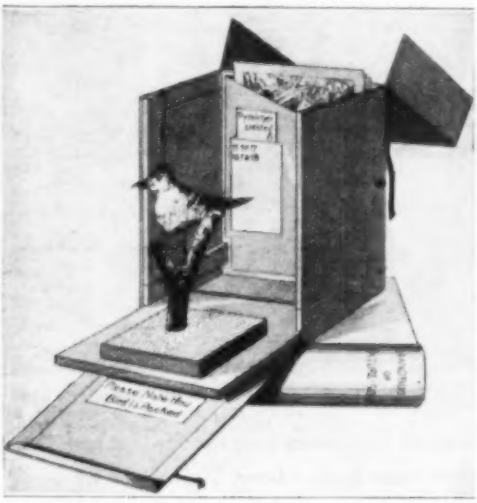


With This Outfit, Anyone can Make Up a New Battery for His Flash Light. The Operations, as Illustrated Above, Are Very Simple, and a Cell That is Not Deteriorated by Storage is Assured

prongs turned down over the cork. The ingredients keep indefinitely. The cells are supplied in standard sizes.

BOXES FOR STUFFED BIRDS REDUCE BREAKAGE DANGER

Confronted by the problem of distributing several hundred stuffed birds among the schools of an eastern city, the



Danger of Damage to Stuffed Birds and Other Specimens While in Transit is Lessened by This Pasteboard Packing Box

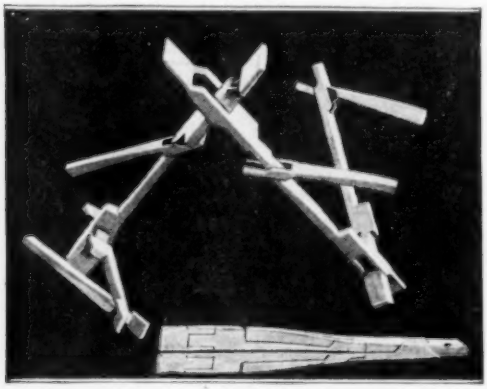
staff of the public library of Newark, N. J., devised a packing box which precludes any reasonable possibility of damage to the specimens in transit. Made in two sizes, the boxes are hinged so that the front may be dropped and the lid raised. A wooden base, on which the stuffed bird is fastened, slides into the box from the front, resting on the bottom, to which it is held by strips.

ARKANSAS CANNING CLUBS AROUSE MEN'S INTEREST

Men are as actively interested as women in the work of the Arkansas community canning clubs, though these supposedly are women's organizations. At a recent meeting of one of the clubs the men packed string beans, carried water, and operated the steam-pressure canner. As a result, at this demonstration there were put up 60 gal. of beans and 7½ gal. of tomatoes. In the same county the men have built and equipped a house for a steam canner, belonging to another club. Some of these clubs in the Ozarks are miles from a railroad, and the home demonstration agent must needs travel on horseback, fording many streams and covering long distances.

MULTIPLEX PLIERS SHOW SKILL WITH KNIFE

An interesting exhibit in a western Museum of Wood is furnished by a little article not one-half inch thick and less



This Puzzlelike Specimen of a Wood Whittler's Skill, When Opened Up as Shown, Proves to Consist of Seven Sets of Pliers. Assembled, the Piece of Wood Is About Four Inches Long and One-Half Inch Thick

than four inches long. This piece of wood opens out and discloses seven distinct sets of pliers. These are intended as specimens of skillful whittling, and obviously are not for use.

PLAN TO PUT COAST GUARD IN THE NAVY

The United States Coast Guard was created in 1915, as a military force, and consists of the former Revenue Cutter Service and the former Life-Saving Service. Congress provided that in time of war the coast guard should be operated by the navy and in time of peace by the Treasury Department. The navy is desirous of adding the coast guard as a permanent branch, which seems the logical department for such work, and inasmuch as something like a million dollars a year can be saved by the transfer, and other advantages be secured, the change seems desirable. As a part of the navy, the young men of the coast guard would find opportunity to graduate into better positions, which at the present time are not available in the Treasury Department.

¶Studying the housing problem, the city authorities of Kenosha, Wis., found that there were 500 vacant lots, located on streets with water supply and sewer connections, in that city. Money may be advanced owners of these lots to encourage building.

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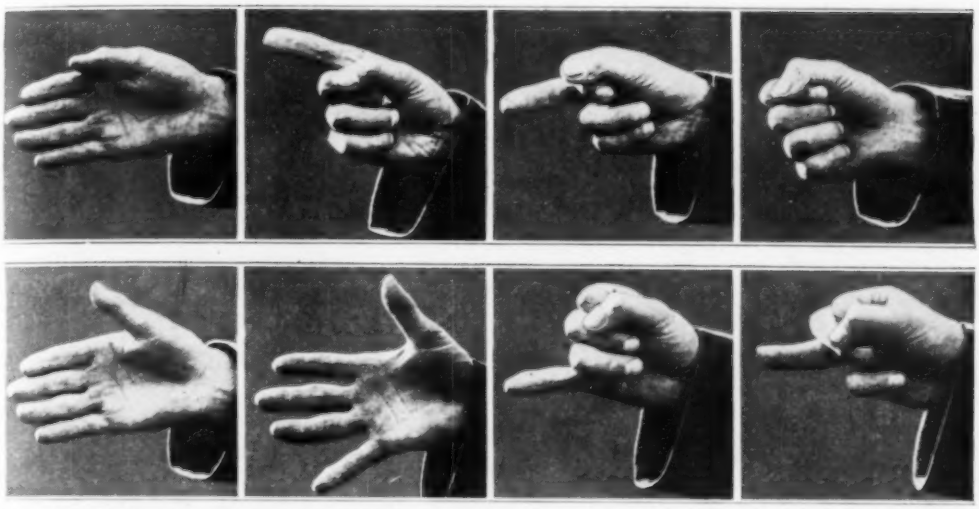
OBSERVATION CARS AGAIN FOLLOW ROWING CLASSIC

FOR the first time since 1916 these two observation trains recently bore happy crowds along the four-mile course of the Yale-Harvard race, rowed on the river Thames at New London, Connecticut. Blue for Yale and crimson for Harvard fluttered frantically from trains, river banks, and gay pleasure craft, as the eight from Yale vanquished the Harvard crew in a grueling neck-and-neck struggle. Each university now boasts 26 victories as its share of the 52 annual contests.



Here Are Eight of the Signals by Which a Big-League Catching Star Communicates His Wishes to the Pitcher. The Pitcher Interprets Them in This Way: Left to Right: Upper Row, Fast Ball, Outcurve, Spit Ball, Waste Ball or Pitch-Out; Lower Row, Another Waste Ball, Slow Ball, Knuckle Ball, Incurve

BIG-LEAGUE CATCHER REVEALS SECRET FINGER CODE

One of the most important, but inconspicuous, elements of "inside baseball" is the silent finger code by which the catcher communicates with the pitcher. Unluckily, the fans in the grand stand miss it all, since the catcher flashes each signal from behind his mitt, where it can be seen only by his battery mate. The system used by a star in a big-league club is simple and easily memorized. For a fast ball, his right thumb is pressed flush against the forefinger as the palm is exposed to the pitcher. For a spit ball he crooks all but his second finger. For a waste ball or pitch-out he simply clenches his fist. And so on, through the whole list of possible deliveries.

SIMPLE CHARTS UNTIE HARD MATHEMATICAL KNOTS

Cubes and squares and their roots, logarithms and complex special formulas, to say nothing of multiplication and division, are worked out in a few moments with a recently devised set of charts. To get the answer to any problem, a straightedge, furnished with the set, is simply placed to intersect the two known factors of the problem, and the solution is instantly found at a third point. With 18 charts the whole range of numbers up to 1,000 is covered. Special editions are prepared for chemists and sugar technologists.

COUNTY BRIDGE DEDICATED TO FALLEN HERO

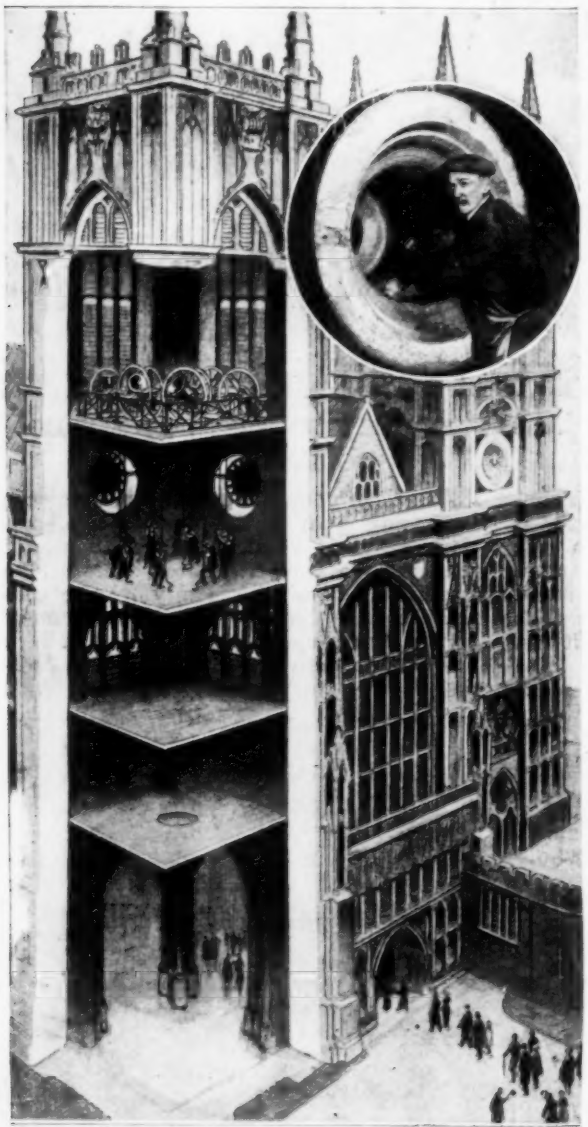
American communities are looking with increasing favor on the practice of memorializing their soldier dead with useful public improvements. A steel-truss bridge was thus dedicated recently by the citizens of Page County, Ia., to the memory of the first Page County lad to fall in France. In delivering the speech of dedication, the governor of the state paid

This Steel Bridge was Recently Dedicated by the Governor of Iowa to the Memory of a Soldier-Hero Who Died of Wounds Received in France

tribute to the hero's mother, who occupied a position of honor.

BELLS OF WESTMINSTER ABBEY READY TO WELCOME PEACE

The old bells that hang in the belfry tower of Westminster Abbey, London, were recently overhauled with a view to their being rung on the signing of peace. To complete the "peal" of eight, it was found necessary to cast three new bells, to recast one of the original set, and to retune the other four. All the work is being done in an ancient English foundry where the intricate science of bell casting has been practiced for 349 years. The extensive experience and skill required for the production of a perfect bell is not generally appreciated. Yet the components must be of the finest quality, must be mixed in careful proportion, and the molten metal must be run into a mold which is designed by an expert craftsman. On being removed from the mold, and after having thoroughly cooled, which, by the way, sometimes takes several weeks, the bell should produce a perfect tone with very little tuning. When correctly struck, it should give out three distinct notes: a "fundamental," the octave above or "nominal," and the octave below or "hum note." Only the most delicate proportioning of material and design will produce a bell in which all three notes are true.



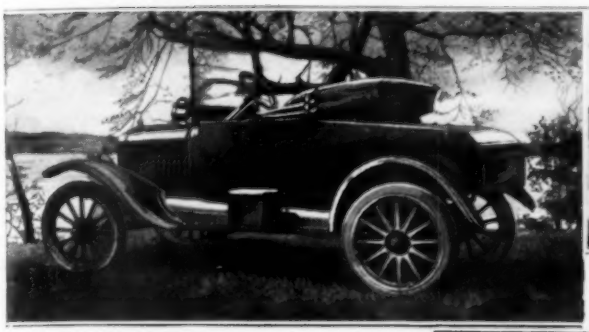
PHOTO, © UNDERWOOD & UNDERWOOD — DRAWING FROM THE SPHERE, © BY N. Y. HERALD

The King and Queen of England Christened These Eight Victory Bells Which Now Hang in the Northwest Tower of Westminster Abbey. The Insert Pictures a Workman as He Chisels the Inscription on One of the Bells

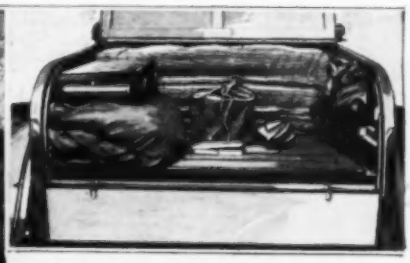
TWENTY THOUSAND TRUCKS TO BE GIVEN STATES

Twenty thousand trucks, found useless to the War Department, are to be given away by the secretary of agriculture to the highway departments of the various states, which have only to pay loading and freight charges to acquire the machines. The value of the trucks is over $45,000,000. Of the total number, 11,000 are new and 9,000 have been used. All are in serviceable condition. The capacity of the trucks ranges from two to five tons each. Under the law which authorizes the distribution of the trucks, the states to which they are given must use them in the construction of roads for which Federal aid is given. An appropriation of $2,000,000 was made recently for this purpose. None of the trucks may be given to counties or individuals.

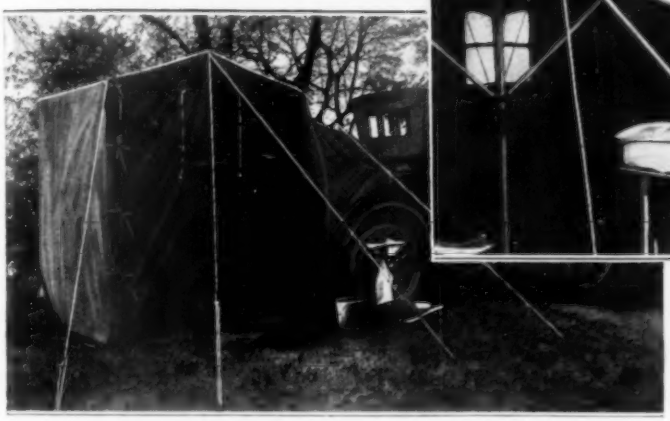
¶The first commercial flight between the United States and Cuba was made recently by a seaplane. The 381 miles from St. Petersburg, Fla., to Havana were flown in five hours 20 minutes.



There Is Nothing about the Automobile in the Picture Above to Hint That It Carries a Complete Camping Outfit, but That Is the Case, and It Is Very Complete



Packed Away, the Camping Outfit is Shown Above. There Is Room for Food and Clothing in the Same Compartment



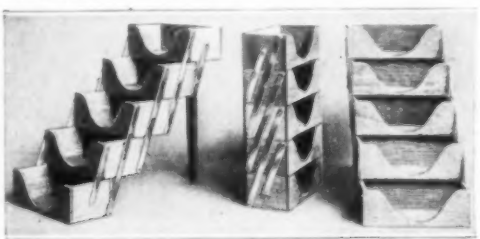
To the Left Is a View of the Tent, Attached to the Rear of the Automobile While, Above, a Peep into the Shelter may be Had Revealing the Convenient Arrangement of Its Interior

COMPLETE CAMPING OUTFIT HIDDEN IN AUTO BODY

In appearance nothing more than part of the body of a certain common type of small automobile, a new attachment conceals a complete camping outfit, including a tent, spring mattress, gasoline stove, table, two camp stools, chair, washstand, lantern, ax, aluminum cooking outfit, and water bucket. An advantage of this arrangement, the makers say, is that one may go camping without announcing the fact by the unusual appearance of one's automobile. Less than five minutes is required to set up the outfit. A bed is formed by attaching the table to the rear of the automobile and placing the mattress on the platform thus formed. Room is provided for carrying food and clothing in the same compartment which holds the outfit. The attachment is recommended by the manufacturers for week-end camping trips, though the equipment is sufficient for considerably longer stays in places out of the beaten path.

STAIRLIKE CURRENCY TRAY USES SMALL DESK SPACE

For the conservation of desk space a folding currency tray has been devised by a western man. It consists of a series of wooden boxes, held together by strips of metal which allow them to extend in



This Tray was Devised for the More Convenient Handling of Paper Currency

the form of a stairway. A support extends from the back of the top tray to a level with the bottom of the lowest tray. The increased circulation of paper currency was one reason for devising the tray.

GOCART USED TO DELIVER BOOKS IN HOSPITALS

The sick soldiers now reach out from their couches in the army hospitals in and near Chicago and select books and magazines from a little gocart delivery machine that is used by representatives of the American Library Association. It is a light affair with rubber-tire wheels, which make it noiseless and easy to handle. The convalescents call the service "books à la carte."

PHOTO BY SGT. GUY M. SCOTT

Books are Served to Sick and Convalescent Soldiers in Hospitals of the Chicago District, from "Tea Wagons" Built for Literary Instead of Culinary Purposes. They Are Easy-Running and Silent

NEW CABLE TO SOUTH AMERICA WILL FORM DIRECT LINK

A new cable line, 3,200 miles long, forming a direct connection between North and South America, is a project whose completion within the next few months is confidently expected. The island of Barbados, at the eastern edge of the West Indies, is the connecting link in the plan, the proposed route running from that point to Belem, Brazil, where it will connect with the British telegraph network in South America; and to Miami, Fla., joining there the great wire system of the United States. The British and American companies each will lay about half of the new cable, Barbados being near the center of the route.

TRY CONCRETE FREIGHT CAR WITH DRASTIC TESTS

If the most severe uses of railroading could break it down, the concrete gondola car described in Popular Mechanics Magazine last May would have been put out of service before this. In the Chicago yards it was given unusually rough treatment, but the only result of its fast flying switches was to smash the ends of other cars. After serving in the Illinois coal fields, it returned to Chicago with a load of coal, and was unloaded with a clamshell scoop. Inspection failed to reveal the slightest indication of defect, no signs of crack or chip being found. The car has now gone to Pennsylvania with 45 tons of steel rails, and there will handle steel products until it either gives up or proves itself indestructible.

BEET GROWERS USE NET UNLOADING CROP

Sugar-beet growers are now employing a strange method of saving time and labor in transporting the crop from the field to the sugar mill. A large net is placed over the body of the wagon rack, and after the load is on, the net is closed and tied in the center. Upon reaching the mill a crane lifts the entire load off at one operation, and transports it to the crushing machines.

The Net Which Incloses the Sides of the Wagon Contains the Whole Load of Sugar Beets, and Enables Them to be Removed by a Crane in One Operation, Saving a Great Deal of Labor

Spraying Concrete Pavement with a Solution of Creosote and Mineral Dye of a Deep-Green Hue Dispels the Disagreeable Glare in Bright Sunlight, and Substitutes a Restful and Soothing Effect. The System is Used with Success by an Eastern Amusement Park

CONCRETE WALKS SPRAYED TO OVERCOME GLARE

After much study and experimentation, an eastern amusement company has succeeded in taking the glare out of its concrete walks. This was done by applying a solution of mineral dye and creosote. At first a spraying process was used, but owing to the solution being found non-injurious to the workers, it was later applied with large brushes. The effect is very pleasing, as the dye gives the concrete a rich deep-green color, which is restful to the eyes and harmonizes with the surrounding trees.

FILIPINO GIRLS SUCCEED AS BUS CONDUCTORS

Uniformed Filipino girls have given excellent satisfaction as conductors on motor busses in Manila, and have proved again the truth that woman's place is not necessarily in the home. The inability of the street cars to handle traffic in the island city made it necessary to start the bus line. At present there are 13 machines, but plans have been made to increase the number to 50. Thirty passengers are carried in the busses now in use, but the new ones will carry 60 persons. The directors of the auto-bus company declare themselves thoroughly satisfied with the ability of the native girls.

HUMANE ANIMAL MUZZLE OPERATED BY GRAVITY

The secret of a recently introduced humane muzzle, which allows the animal wearing it perfect freedom of the jaws

As Long as the Animal Wearing This Muzzle Keeps Its Nose toward the Ground, the Gravity-Operated Catch will Allow the Jaws to be Opened. When the Head is Raised, the Contrivance Restrains

when the head is in a lowered position, but which restrains when the head is raised, lies in a gravity-operated catch. This catch holds a rubber-covered metal bar firmly under the lower jaw when the animal's nose is not pointed earthward, but is disengaged by the force of gravity when the nose is lowered. Springs come into action when the catch releases the bar, holding it gently against the jaw,

and the animal may eat from the ground with ease. The muzzle may be used as a curb for vicious dogs or for weaning calves and colts.

AIR MAIL PLANNED FOR TOWNS IN CANADIAN ROCKIES

Few portions of the earth's surface seem to promise less for the development of commercial aviation than mountain-strewn British Columbia. Yet a Vancouver newspaper has joined with an aerial association of the city in promoting a flight across the Rockies and back, in order to demonstrate the feasibility of an airplane mail service to the isolated mountain towns. Details of the trip are being worked out as the promoters await the arrival of a long-distance bombing plane from England. Starting at Vancouver, the flight will be made over a triangular course, the first leg extending 400 miles eastward to Calgary, Alberta, the second north to Edmonton, a distance of 200 miles, and the third to Vancouver again.

This Group of American Aviation Mechanics Built the Whose Plans have been Followed

BALANCED ROCK IS CONCRETED TO SAVE SCENIC FEATURE

Repairing scenery with concrete is an unusual aid to nature, but it was found necessary at Castle Ford, Idaho, where a remarkable specimen of balanced rock seemed in danger of losing its balance. The rock, on a mountain crest a short distance from town, is about 30 ft. high and 25 ft. across at the top, its vast weight supported on a stem only 3 ft. or so in diameter. Despite this extraordinary top-heaviness, which contributes a novel scenic effect attractive to great numbers of tourists, the rock's center of gravity has been calculated to lie well within its narrow pedestal. With its new concrete reinforcement the curious pillar, whose top bears the huge likeness of a human face, will probably stand for all time.

¶ Famous now as a health resort, Bath, England, may become famous also as an important city in the glass-coloring industry. Since it was discovered that glass may be permanently tinted by immersion in the hot mineral waters of Bath, experiments have been made with the idea of developing a stained-glass industry there.

By Repairing with Concrete the Thin Neck of a Huge Balanced Rock, as Seen at the Left, the People of an Idaho Town Were Able to Preserve a Remarkable Scenic Feature, the Distant Profile of Which is Pictured at the Right

Caproni Biplane While Stationed at Milan, Italy. The Civilian in the Center, Gianni Caproni, Is the Designer by the United States Government in the Construction of Many Other Big Bombing Planes

AMERICAN WORKMEN BUILD BIG CAPRONI BIPLANE

In addition to the routine repair work, the American aviation mechanics at Milan, Italy, were able to do some actual construction. A number are shown in the illustration grouped before the first Caproni airplane to be built by American workmen. The picture is of double interest, as the group includes Gianni Caproni, known to the profession as the "Apostle of Big Planes."

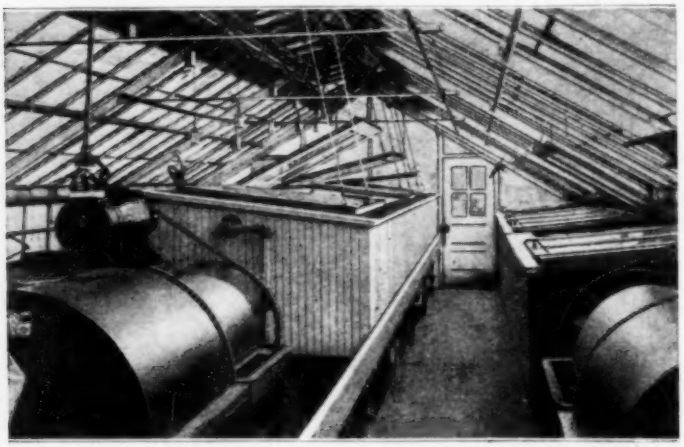
BASE OF ANCIENT TREE SERVES AS WELL CURB

The hollow base of an enormous buttonwood tree, believed to have been planted by the Indians as a boundary mark 250 years before it was felled, is now serving as a well curb in a Rhode Island town, near where it grew. A roof for the curb is made of other parts of the tree. On the side next to a highway which runs alongside the property of the owner of the well, a sign inviting travelers to stop and quench their thirst has been painted. At the top the curb is 54 in. in diameter and 72 in. at the base. Inside the unusual curb is the pump.

What Remains of a Buttonwood Tree Two and One-Half Centuries Old Is Now Serving As a Well Curb in a Rhode Islander's Yard

REFRIGERATING PLANT ADDED TO EQUIPMENT OF HOTHOUSE

Of all the blueberry plants he carefully tended in his warm greenhouse during the winter, a botanist found only one in blossom in the spring. And that one survived because it had wisely pushed its way through a hole in the glass roof toward the invigorating severity of the outside temperature. As a result of his discovery, the scientist has installed a refrigerating plant in his greenhouse where he now "winters" his plants at his discretion, thus conducting his experiments regardless of the season.



COPYRIGHT, HARRIS & EWING

This Hothouse Is Remarkable for Its Refrigerating Plant Which Enables the Botanist to "Winter" His Plants at His Discretion. The Scientist has Found a Variety of Shrubs Which will Blossom Only after Treatment of This Sort

PLAN UNITED STATES MAP MADE FROM PHOTOGRAPHS

Every square inch of the surface of the United States will be photographed from aeroplanes in the preparation of a topographical map of the country which is being planned. The photographs will be pieced together and the mosaic will show every detail. This sort of a map is considered necessary by aviators before full use of the aeroplane will be possible. No map in existence takes in all that the proposed photographic map would show.

¶An enormous gas cloud gathering on the sun forms an arc 340,000 miles long on the edge of that body, astronomers say. It is about 125,000 miles away from the edge, and the distance from the sun to the top of the cloud is estimated to be 200,000 miles.

ONE-LEGGED SPORTSMAN CONTINUES HIS PLAY

Although he found it impossible to wear an artificial limb, an English sportsman who lost his right leg a short distance below the hip joint, was able to lead an active life, aided by crutches. Within a year after his leg was removed, he was able to swim and ride a horse. Later he took up shooting, and eventually played golf, drove a motor car, and rode a bicycle. On the latter he has ridden as far as 30 miles in one day. A three-speed gear enables him to climb hills, while a special pedal, on which two straps bind his foot, permits him to apply power during the upstroke as well as the downstroke of the pedal. Mounting the bicycle is the most difficult for the one-legged man. He accomplishes this by locking the front wheel with a brake, balancing himself in the saddle by means of a crutch on his right side, and pushing with the crutch and the pedal at the same moment.

ARTIST PAINTS PICTURES ON AUTOMOBILE

An Oregon motor owner, who is also an artist, has decorated his car in a novel manner. On one side he has painted the picture of Crater Lake, a national wonder, while on the other side he has depicted Ashland Creek. The auto being new, the panels presented a splendid surface for the pictures, and excellent results were secured.

Touring Car that Carries Its Scenery with It, in Panels Painted on Its Sides by the Owner

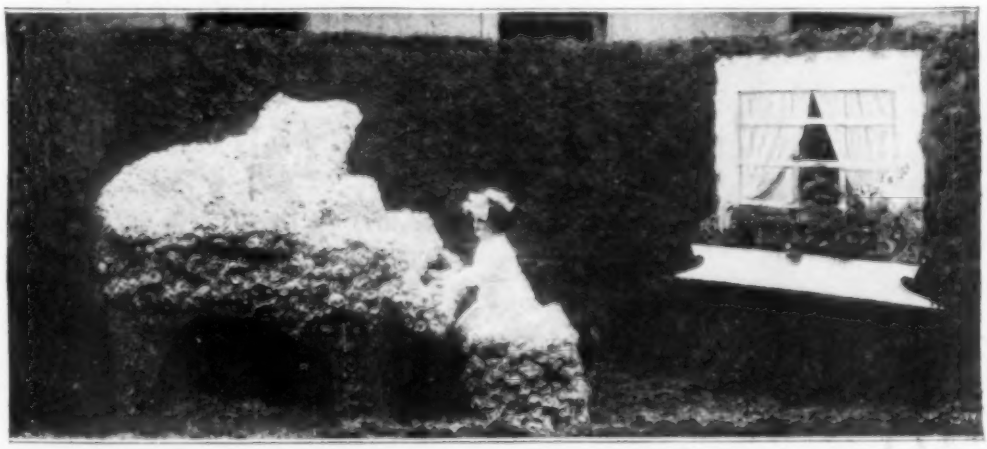
The Tangled Mass of Iron Above Was Modern Machinery before the Blast, While at the Right is Seen All That Remained of the Starch Plant, with Fire Completing the Destruction

EXPLOSION IN STARCH PLANT BRINGS DEATH AND RUIN

An explosion of extraordinary violence and destructiveness recently wrecked a starch factory at Cedar Rapids, Iowa. The demolition was so complete that the cause could not be determined with any certainty, opinion being divided between ignited mill dust and an overheated boiler. Few of the 150 workmen engaged at the time of the accident in night work at the plant escaped injury or death, the list of those killed reaching 20 or more. Water mains in the vicinity were broken by the blast; windows were smashed throughout the central portion of the city, which has a population of 33,000; and a mile away persons were thrown from their chairs, while the fronts of several buildings were shattered. Places 30 miles distant reported hearing the detonation.

SIXTEEN THOUSAND ROSES USED IN DISPLAY

Seldom are flowers used as lavishly as they were by a musical-instrument dealer in an Oregon city during a recent rose carnival. A window display required 16,000 pink roses, which completely covered a grand piano and a piano bench. At the instrument in the midst of the floral profusion was seated a wax figure, representing a child playing.



In One of the Famous Rose Carnivals of a Pacific Coast City, a Single Window Display, Made by a Music Dealer, Fairly Out-Flowered the Carnival by Covering a Grand Piano and Its Bench with 16,000 Pink Roses. The Wax Figure Seated at the Instrument Represents a Child Performer

CAFETERIA SYSTEM LETS PIGS SELECT THEIR OWN MENU

Discovery that small pigs are competent to select the menu best suited for them is being put to good use by Corn Belt farmers. Pig cafeterias, consisting of little houses with feed hoppers supplied with corn, meat, meal, wheat by-products, salt, and other delicacies, multiply the weight of the young porkers, until, before their first birthday, they are sold at a good price. A bar fence keeps the big pigs out of the cafeteria.

This Is a Cafeteria, Whose Patrons are Taking a Nap in the Foreground. Feed Hoppers Containing Various Nutritious Substances Enable the Little Pigs to Select Their Own Food

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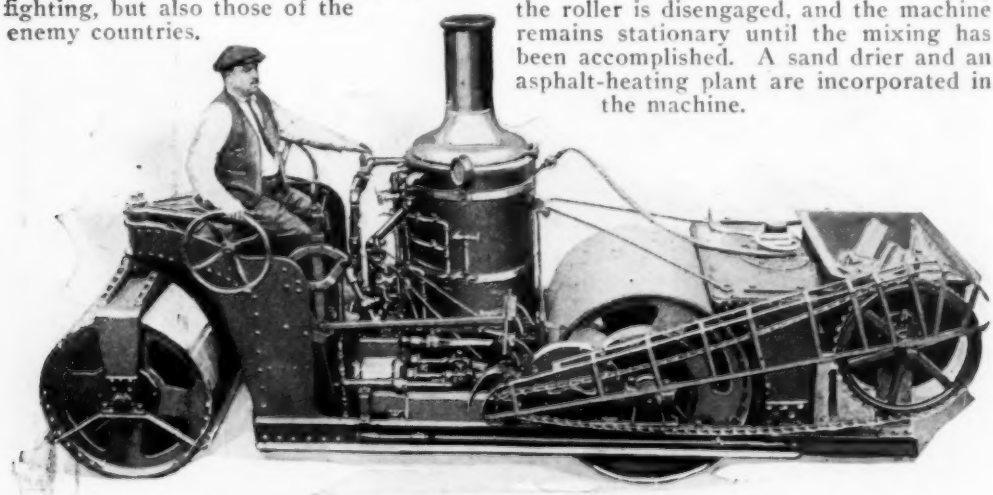
¶War posters of every nation involved in the war were exhibited recently in the public library in New York. The exhibits included not only those of countries associated with the United States in the fighting, but also those of the enemy countries.

CAGE LOCK CANNOT BE PICKED WHEN NEW DEVICE IS USED

Persons skilled in criminal craft usually find little difficulty in picking the locks of bank and cashier cages by threading wire or string around the latch. A Chicago inventor has prevented further tampering of this kind by surrounding the latch with a rectangular casing projecting from the edge of the door, which fits into a corresponding recess in the latch-keeper case on the jamb. This interposes a positive barrier against any attempts to get at the latch when the door is locked. For all doors that slide instead of swinging on hinges, this form of lock should be an excellent protection.

MIXER ATTACHED TO ROLLER AIDS STREET REPAIRERS

A mixer for asphalt or concrete is carried as a component part of a street roller used by a Pennsylvania city and has proved to be a great timesaver for street-department employes. Attached forward of the water tank, the mixer is driven by a sprocket chain from a sliding gear on the crankshaft of the engine. When the mixer is in operation, the gear driving the roller is disengaged, and the machine remains stationary until the mixing has been accomplished. A sand drier and an asphalt-heating plant are incorporated in the machine.



Two Machines Usually are Required to Mix and Roll Asphalt or Concrete, but This Machine will Perform Both Operations. It is Used by the Street Department of a Pennsylvania City

CONCRETE HANGARS FIREPROOF IN EVERY DETAIL

Should an airplane catch fire in one of the government's new-type, fireproof hangars, the building could be so tightly sealed that the fire would virtually be smothered. The material used is chiefly concrete and steel, with a roof of tile, wire-glass windows hung in metal frames, and steel doors of the roller type which are opened and closed with power from an electric motor. The airtight feature is supplied by a system of ventilating windows which may all be closed instantly by throwing a single lever. In addition to reducing fire risk, such well-built hangars will serve until air planes go out of fashion or change radically in construction.

This Government Hangar Is of Concrete and Steel, a New Type Which Costs about $35,000. They Are Worth the Price, as They will Last for Years, and Are the Last Word in Fireproof Construction

DANGER IN CASSEROLES FOUND BY WOMAN

Poison may lurk in the glazed casserole, used so generally for baking, if tests made by a woman scientist are to be relied upon. Lead used by the manufacturers of these vessels for glazing may be extracted, the experimenter found, by the use of acids and heat. Her conclusion is that foods containing acid juices or vinegar should not be cooked in a casserole, unless it is known certainly that the glazing contains no lead. Boiling a one-per-cent solution of citric acid in a casserole for 30 minutes extracted, in several cases, from .03 to .06 gr. of lead monoxide for every 15.5 sq. in. of surface. Even after 10 or 12 boilings, lead was extracted, though the quantity grew less as the tests grew in number. Water containing more than .01 gr. of lead per gallon, or, in other words, one part of lead to 7,000,000 of water, is considered unsafe for drinking purposes.

¶The baobab tree of Africa yields a fiber which has been pronounced by Scotch experts to be the finest paper-making material to be found, and very flexible in the results it accomplishes.

SHELLS SHOW GAS RECORDS AS WAR ENDED

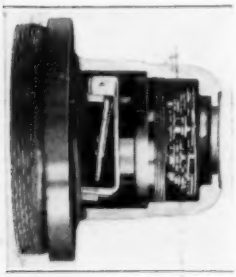
A clever device prepared by the chemical-warfare service visualizes the mustard-gas production of the various powers at the time of the signing of the armistice. Giant shells were used to represent the American, British, French, and German gas-making records. These shells formed part of the chemical-warfare display of 18 floats in a recent parade, and showed more "action" than any other unit participating in the event.

Float Entered in a Recent Parade by the Chemical-Warfare Service, Depicting the Relative Production of Mustard Gas by the Great Powers

Other floats carried airplanes, a captive balloon, and army ordnance.

NEW DRIVING METHOD USED FOR HUB ODOMETER

An entirely new method of driving a hub odometer for automobiles is used in an improved type of this mechanism now being sold. In the old type it was necessary to have made in the axle, or in the nut on the end of the axle, a hole or slot in which the operating lever of the odometer was fitted. None but the simplest tools are required for the proper adjustment of this new odometer, the operating lever of which is pressed into one of the slots of an ordinary castellated nut on the end of the axle by a stiff spring. Nearly all automobile axles are equipped with such nuts, or may be so equipped at any garage. An unusual feature of the recording mechanism of this odometer is that it has no spiral spring in its make-up.

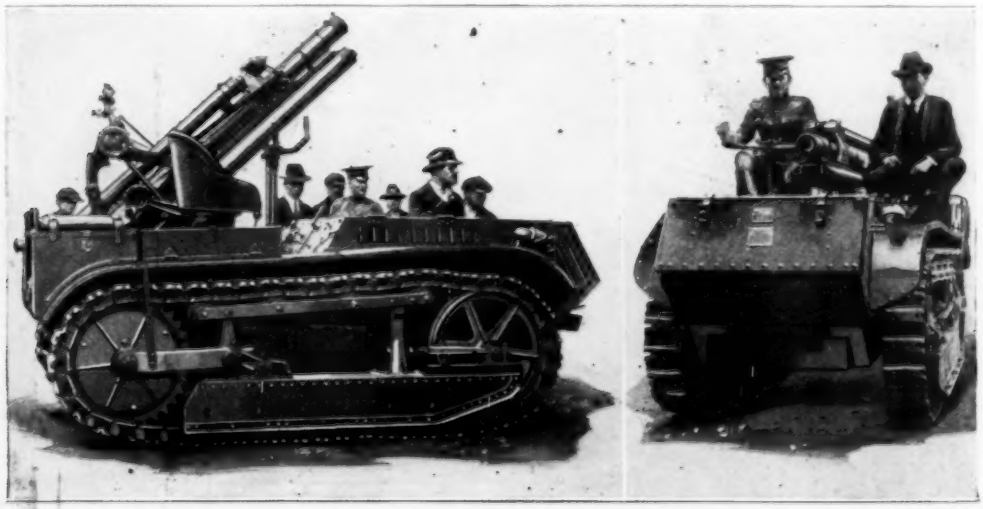


MANY USES FOR AIRSHIPS SEEN BY AUTHORITY

Dirigibles may be used to advantage by every department of the government, according to a high War Department official, who urges the establishment of army airship bases throughout this country and the colonial possessions of the United States. Some of the uses to which the ships could be put, says this authority, are chasing criminals, guarding borders, making crop surveys, cruising timber areas, warring on destructive insects, especially the locust, and delivering mail in regions where any other sort of transportation is difficult. He believes the dirigibles could be operated at comparatively small cost, considering their value in work of this kind.

ARTILLERY EVOLUTION CAPPED BY TRACTOR-MOUNTED "75"

As army experts report on the performance of the 75-mm. gun's new tractor mount which climbs hills like a tank, and speeds along the level at 15 to 20 miles an hour, it is interesting to recall the mounting of the very first cannon. The first crude guns were laid flat on the ground between two timber supports, the breech resting against a wooden post which absorbed the recoil. To batter down a castle, the guns were "planted" a hundred paces from the wall and fired until the walls fell down or the guns blew up. Later, about 1450, the familiar wooden, horse-drawn carriage appeared, satisfying all requirements until these days of scientific, high-speed warfare typified by this combination of the peerless "75" with the endless-tread tractor, resulting in an extremely mobile and effective arm.



Making a Few Alterations in a Stock Model, a Manufacturer of a Well-Known Endless-Tread Tractor has Produced a Very Satisfactory Mounting for the Americanized 75-MM. Fieldpiece. Its Extreme Mobility and High Angle of Fire Make the Combination Valuable in Repelling Attacks by Hostile Air Craft. Seats are Provided for Three Gunners in Addition to the Driver

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The Crews of the Three Transatlantic Seaplanes were Welcomed in True American Style on Their Arrival in Paddington Station, London. A Howling, Self-Appointed Committee of American Sailors and Soldiers Rushed the Cars, and in a Twinkling Had Lieutenant Commander Read, of the "NC-4," on Their Shoulders. He was Borne in Triumph up and down the Station Platform

AMERICA'S TRANSATLANTIC SEAPLANE VISITS ENGLAND

By PAUL A. JENKINS

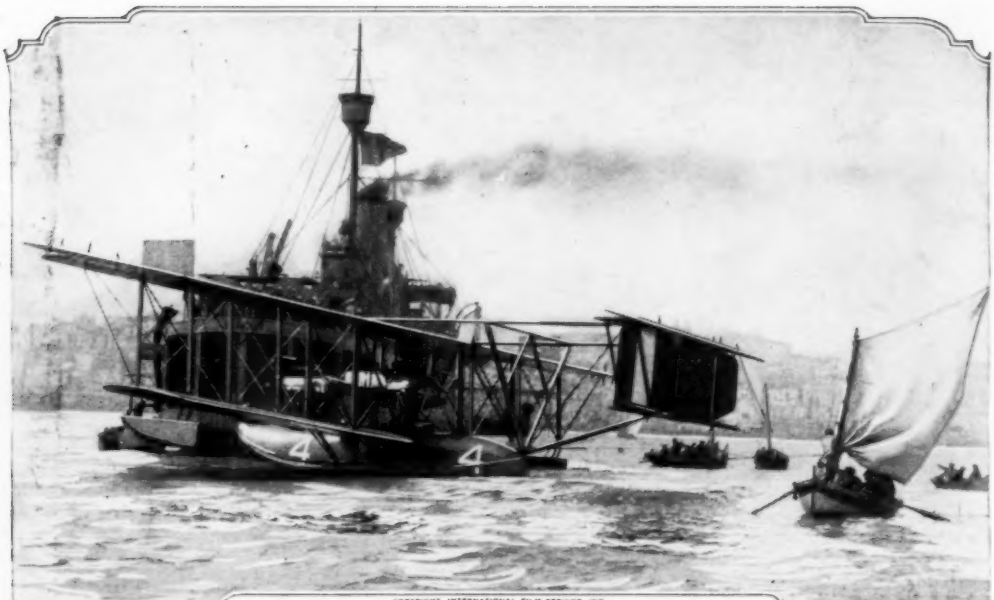
THE arrival of the seaplane "NC-4" in the harbor of Lisbon, Portugal, completing the unprecedented flight of 2,150 miles across the Atlantic Ocean—this was really the climax of our navy's gigantic experiment in transoceanic airplane flight. But it was felt by officials in Washington, by the crew of the "NC-4," and by the American public, that the journey should rightfully be continued to England, if for nothing else than to strengthen the ties of friendship which unite the two nations.

So, in the early morning of May 30, after a pleasant sojourn of three days among the hospitable Portuguese, the "NC-4" slipped from Lisbon harbor and headed north. Familiar now with every inch of their well-tried ship, the crew felt confident of reaching Plymouth and a royal welcome that same evening. But when only 100 miles from Lisbon, the port engine developed a slight leak, necessitating a halt on the Mondego River. Repairs were made in short order, and at 1:38 in the afternoon the "NC-4" pointed her nose northward once more. As the plane zigzagged to escape rain squalls, the 220 miles to the northwest tip of Spain sped by, and at 4:47 p. m. a landing was made in Ferrol Harbor. The delay at Mondego was short, yet enough to make impossible the completion of the trip that day.

But at 6:27 on the morning of May 31, having been on the way 23 days, the "NC-4" rose for the last effort which should carry it across the Bay of Biscay and over the English Channel. The flight was made with ease, despite heavy rain and an almost continuous blanket of fog which hid all but two of the route-marking destroyers. At 1:12 p. m., the crowded water front of Plymouth became visible through the shrouding mist, and at 1:26 the "NC-4" touched water in the harbor that witnessed the sailing of the Pilgrim Fathers 300 years ago. Thereafter followed days replete with banquets and receptions.

But back in Washington, D. C., these days were spent in study and conference by the silent men who planned the magnificent venture. From the logs of the foundered "NC-1," the dismantled "NC-3," and the triumphant "NC-4" were drawn the lessons taught by success and failure.

They first found that the "NC-4" had flown, through an atmosphere often thick with fog and rain, a distance of 3,925 nautical miles in 55 hours and 33 minutes, or at a speed of 70.1 miles an hour. They were gratified by the proved seaworthiness of the hulls, and by the unshakable sturdiness of struts, spars, and the other elements of the flying surfaces. Those who



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The Seaplane "NC-4" is Pictured beside the U. S. S. "Shawmut" in Lisbon Harbor on the Completion of the First Transatlantic Flight. The Romance of the Exploit was Nowhere More Appreciated Than in Lisbon Itself. Ships Were Gay with Bunting; Homes, Shops, and Cafés were Emptied as Bulletins Proclaimed the Steady Progress of the "NC-4" from Ponta Delgada

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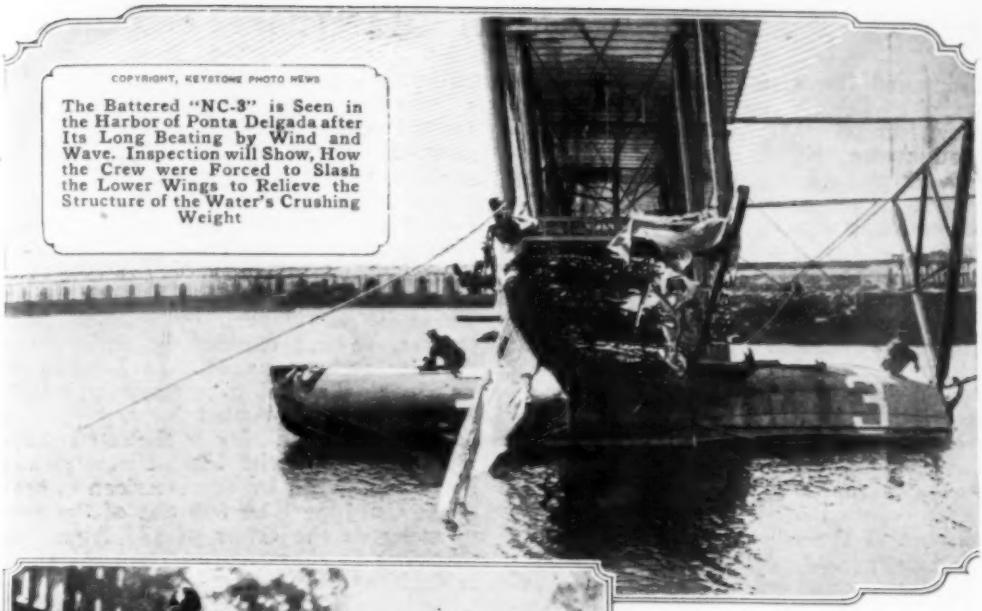
After a Brief Rest aboard the U. S. S. "Aroostook" the Triumphant Crew of the "NC-4" were Conveyed to the Barbican, Plymouth's Ancient Stone Pier. Here They Passed between Ranks of British Bluejackets to the Mayor of Plymouth, Dressed in Robes of State, Who Welcomed Them and Later Stood with Them to be Photographed on the Mayflower Stone



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The Battered "NC-3" is Seen in the Harbor of Ponta Delgada after Its Long Beating by Wind and Wave. Inspection will Show, How the Crew were Forced to Slash the Lower Wings to Relieve the Structure of the Water's Crushing Weight

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The People of Britain Welcomed Hawker and Grieve with an Enthusiasm Which has Never been Surpassed. Rejoicing was Centered in London, Where Cheering Crowds Jammed the Route from the Station to the Aero Club. Hawker is Pictured Making Slow Headway on a London Policeman's Horse

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This Is the Wreck of the Sopwith Transatlantic Biplane Which was Forced to the Water in Mid-Ocean, and There Abandoned by Pilot Hawker and Navigator Grieve. Days Later It was Retrieved by the American Steamship "Lake Charlottesville." This Salvage Is Only Less Remarkable than the Good Fortune Which Guided the Little Tramp Steamer "Mary" to the Airmen

sponsored the installation of the once-criticized Liberty engines were jubilant as they learned that, of the four which brought the "NC-4" into Plymouth Harbor, three had started from Rockaway Beach. Much to praise was seen, also, in the carefully planned patrol system which strung destroyers across the ocean wastes like beads on a string.

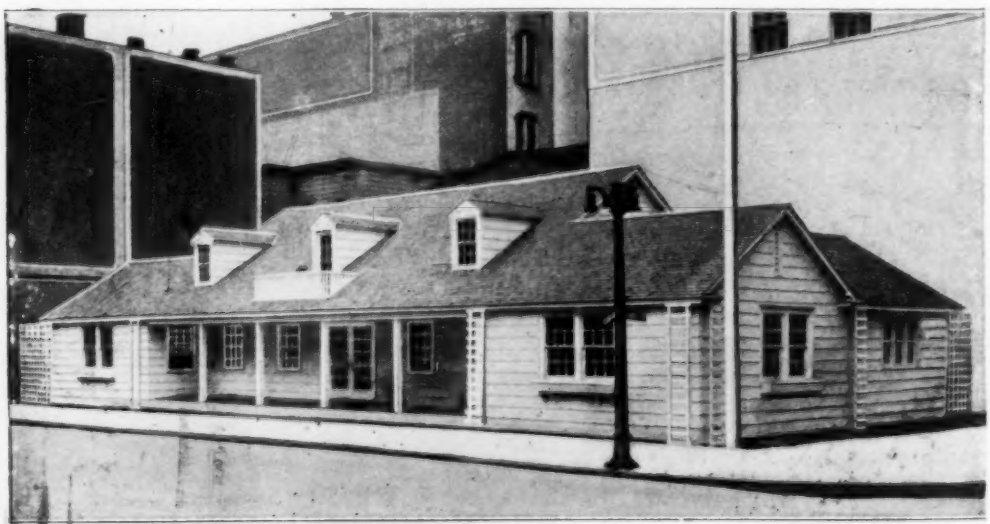
But the lessons of most value were taught by failures and shortcomings. The navigating instruments did good work, yet their inexactness in fog and storm caused the misfortunes of the "NC-1" and the "NC-3" at the Azores. Wing-tip pontoons proved unsubstantial, the "NC-3" suffering especially from this weakness. It was learned, too, that the continuous effort required of the pilots during their watches at the wheels were fatiguing to the danger point. Automatic electric controls were suggested as a means of lightening their task in the future. These and a few other defects were found; but they were matters of detail, dwarfed by the essential worth of hulls, planes, and motors, proved in the most grueling test ever applied to any airplane.

In completing this first chapter in the history of transatlantic air travel, mention must be made of Harry G. Hawker. As he traveled from the north of Scotland, where he was landed by a British destroyer, he was cheered by enthusiastic crowds at every station. In London he was made the hero of a reception which has never been equaled for any general or sovereign. On May 27 the tattered remains of his Sopwith biplane were picked up in mid-ocean by an American steamship. On June 1 he was one of the first to welcome the crews of the American seaplanes as they stepped from the train at Paddington Station, London.

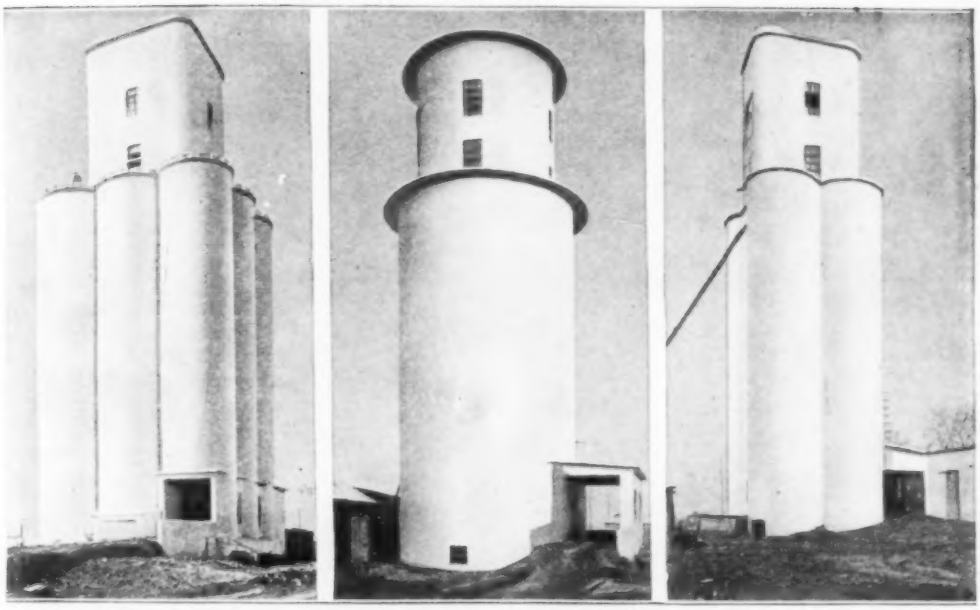
BUNGALOW IN HEART OF CITY AIDS HOUSING MOVEMENT

A model bungalow, recently completed in the down-town district of Portland, Ore., to stimulate interest in providing good homes for workers in local shipyards, is not to be abandoned under the changed conditions following the war. Instead of serving as a headquarters for a special housing committee, however, in it is located the offices of the "own your own home" movement, organized by officials and business men. A soldier and his bride were married in the bungalow as part of the house warming.

¶A special meteorological station to detect and give warning of the approach of tropical storms has been established on the west coast of Florida by the Weather Bureau. These storms develop between the months of June and November.



Bungalow in the Down-Town District of Portland, Oregon, Now Used as Offices for an "Own Your Own Home" Movement: It was Originally Intended as Headquarters for a Special Committee on Better Housing for Shipyard Workers



Three Examples of the Reinforced-Concrete Grain-Elevator Construction Adopted by Farmers' Associations in the Central States: These Are in Illinois, and Have Capacities of 65,000, 35,000, and 30,000 Bushels Respectively, Costing Upward of $10,000 Apiece

FARMERS' ASSOCIATIONS BUILD CONCRETE GRAIN ELEVATORS

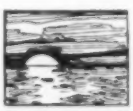
Concrete grain elevators of the most modern construction, and not without artistic merit, are being erected throughout the central states by coöperative associations of farmers. State organizations in Ohio, Indiana, Michigan, Illinois, Iowa, Minnesota, Nebraska, the Dakotas, Kansas, Oklahoma, and Colorado are pushing the new work as fast as possible, erecting structures ranging in cost from $10,000 up, and averaging $20,000. The elevators are located on railroads at grain-growing centers, saving hauling costs, assuring each producer market prices for his grain, and supplying flour, bran, and feed at minimum rates. The cost of insurance is also saved. With the movement growing rapidly, new associations constantly organizing, and a total of 3,000 elevators already in use, there is reason to believe that the notable economies effected will begin soon to react to the benefit of the consumer, in lower prices for corn-fed pork as well as wheat bread.

¶ To have charge of the selling of government-owned wood, concrete, and steel yards, and other plants, a new department has been created, to be known as the Plant Disposal Section. It will function under the Emergency Fleet Corporation.

TEACH NATIONAL ANTHEM BY USE OF PICTURES

Teaching the national anthem by means of pictures supplementing the words, is the idea of a Philadelphia man. He has caused to be printed a pamphlet, on four pages of which are the words of "The Star-Spangled Banner," one verse to each page. Beside each line is a picture visualizing the idea expressed by the words. These pictures are printed in red ink, which gives a patriotic color scheme, as the words are in blue and the paper of the pamphlet is white.

First (or Dawn) Verse



Oh say can you see,
by the dawn's ear - ly light,

What so proud - ly we hailed
at the twilight's last gleaming,

Whose broad stripes and bright stars,
thro' the per - il - ous fight,

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With a Picture to Illustrate Each Line of "The Star-Spangled Banner," It Is Expected the National Anthem will be Easily Memorized

STATUE OF AMERICAN SOLDIER SHOWS SPIRIT OF EXPOSITION

The most complete exposition of governmental activity ever held in Washington, D. C., was recently opened by the secretary of the Department of the Interior. In staging the exhibition the department has two purposes: It would inform the public of the war work done by its technical experts; and secondly, it would advertise its great reconstruction movements, "Americanization" and "Farms for Soldiers." This second, and most important, motive is admirably symbolized by a sculptured figure that stands in one of the corridors. An American soldier is portrayed, home from the war, his sleeves rolled up for the peaceful work which he welcomes with outstretched arms. The work is by Cyrus E. Dallin, sculptor of monuments in many American cities.

This Statue by Dallin, the Utah Sculptor, Forms Part of the Exposition Staged by the Department of the Interior to Mark the Line between War and Peace

ATLANTIC CITY PROVES FOCAL POINT FOR AERIAL INTERESTS

American airmen are fast coming to regard Atlantic City, N. J., as their eastern rendezvous. Among recent developments, it is announced that the Aero Club of America, the Aerial League of America, and the Aerial Coast Patrol have all designated the city as the official center of their flying activities. These and other organizations are preparing extensive programs for the development and perfection of practical air craft. Instruction schools are being opened, too, by many airmen, who find plenty of enthusiasts ready to pay $600 for a course. It is worth noting that a 16-year-old Mississippi schoolgirl was one of the first to complete one of these courses. She celebrated her graduation by looping the loop with her brother, an army aviator, in the passenger cock pit.

WATER-METER WHEELBARROW STOPS WASTE AND THEFT

Means of obtaining exact knowledge of the amount of water used by each gardener in the parks of San Diego, Calif., and a method of making dangerous the theft of water by these employes, were found by the municipal authorities in a meter wheelbarrow recently put into commission. A water meter is attached to an ordinary wheelbarrow, and a gardener, before using water, must connect this meter with the plug or faucet from which comes his supply. Tools may be carried on the wheelbarrow.

Waste of Water by Park Gardeners was Stopped by the Introduction of Meter Wheelbarrows. Now Each Man has to Carry His Own Record

CHILEAN SUBMARINE CREW HAS NARROW ESCAPE

Death looked certain to members of the crew of a Chilean submarine when, a short time ago, the vessel went down in 30 ft. of water in Talcahuano Bay. When a powerful crane hoisted the undersea craft to the surface, several hours after the sinking, the men were nearly suffocated, as they had been standing in the small torpedo room of the vessel, in water up to their necks. It has not been determined what caused the submarine, which was built in the United States, to sink.

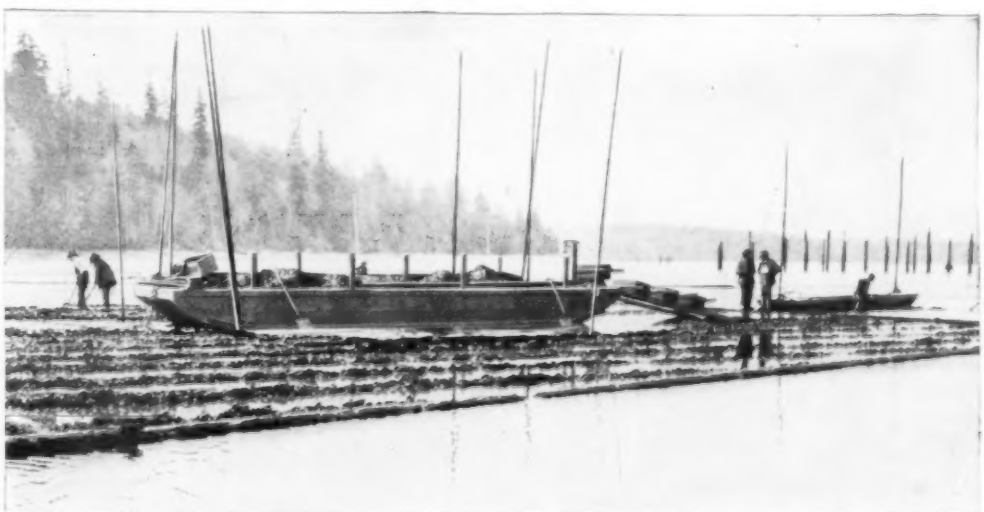
Low Tide on a Washington State Oyster Bed: The Private Growers, Come to Buy of the State, are Raking the "Crop" into Windrows Preparatory to Loading into the Waiting Scow, Whose Permitted Location is Indicated by the Upright Poles, Placed by Deputies

OYSTER FARMING IN WASHINGTON WATERS CREATES NEW INDUSTRY

By L. W. PEDROSE

THE state of Washington has a peculiar oyster. It is a native bivalve that figured in Siwash potlatch festivals centuries before the first white man was seen. In 1913, the state oyster commission, a newly created body, set out to develop the oyster industry by scientifically propagating the small but nutritious bivalve. The state maintains three beds in different localities of Puget Sound. Impetus was given to the project three years ago when it was learned that eastern oysters, transplanted to Puget Sound, would not propagate because the water is cold.

One of the features of growing the native, so-called "Olympia," oyster is the preparation of beds. Ground must be prepared, for if it is soft, the bivalves will



Each Scow's Crew is Allowed About an Acre to Work, and the Operation is Not Unlike Vegetable Farming. The Oysters, Seen in Rows, are Loaded onto the Scow in the Boxes Which Now Rest on the Gangplank. Harvesting Finished, the Next High Tide Floats the Scow Away

sink and become smothered. Also, there is the problem of making harvesting easy, and the protection of the crop from frost in winter and from the sun in summer. Protection is obtained by means of diking, which also facilitates harvesting.

A typical tide flat of sand is first prepared by covering it with a floor of gravel, large and small. This "veneering" process is repeated till the ground is "hardened." Near the low-water mark a concrete dike, a few inches high, is built. When the bed is ready, seed and a small quantity of grown oysters are sown on the bed.

The dikes are so low that they do not interfere with the inflowing tide. When the tide is out, the several inches of water maintained over the beds protects the bivalves. Also, this blanket of water conceals oysters, large or small, from their greatest enemies, the sea gulls and crows, which gobble down the spawn, or taking the larger shellfish in their claws, carry them high in the air, then drop them upon the rocky beach and devour the quivering remains left exposed by the broken shells.

For marketing, the oysters are raked into piles at low tide and loaded onto scows—a much more efficient method than tonging, as done in the East.

The state each year harvests its three beds and supplies oysters to private growers at $2 a sack. The oysters begin to mature in six months. This first crop nets the grower a return above the total cost of seed. The next year's income is all profit, and the opportunity attracts many farmers.

Each spring when the state begins to market seed to the oystermen, the buyers send their scows to the reserves. Locations for each scow are marked out by deputies on the ground. At low tide the loading is begun, and with the return of high water, the scows float away to deposit the seeds on their new owner's ground.

FOREST-FIRE PROTECTION NOW EXTENDED TO NEAR-BY FIELDS

Fire-protection measures have proved so successful in California's forest preserves that the work is now being extended to surrounding hay and grain fields. Forestry officials have learned that field fires are not only the cause of annual loss to the nation, in themselves, but that serious forest conflagrations often are started by them. So the bureau's campaign of public education now includes the fields as well as the forests. As in the forests, campers are warned against the careless use of fire by signs, placed along all the public highways near hay and grain fields.

PROPELLERS FEED CRAWLING WAGON-LOADING APPARATUS

Contractors will be interested in a new motor-driven wagon loader which crawls steadily backward as the bank of dirt, coal, or other material, crumbles before it. As with other machines of this type,

A State Oyster Bed, Inclosed by Concrete Walls Which Maintain About Six Inches of Water on the Bed at Low Tide, Protecting the "Crop" from Frost, Heat, and Predatory Enemies, Yet Making the Harvest Easy

The Heavy Propeller Blades on the Lower Shaft of This Wagon Loader Have a Double Function. As the Shaft Revolves They Push the Crushed Rock, Coal, or Other Material toward the Moving Buckets, Thus Giving Each a Capacity Load. The Same Operation Clears a Path for the Wheels of the Loader, Which is Moved Slowly Backward by the Gasoline-Engine Power Plant. The Relation of the Propeller Blades to the Wheel is Seen More Clearly in the Picture to the Right

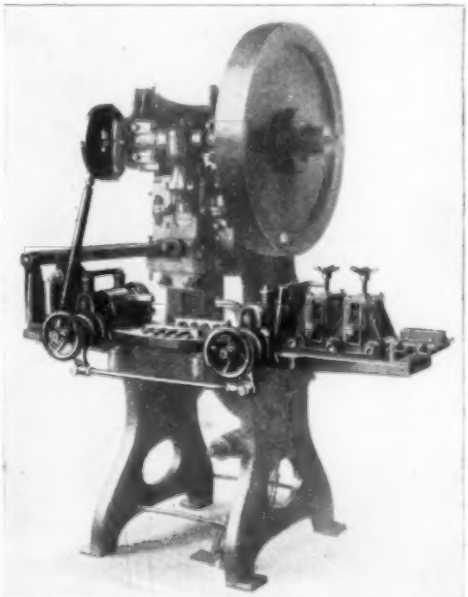
the actual loading is done by an arrangement of buckets on an endless chain. But with this improved apparatus, the shaft at the lower end of the conveyor is extended at either side and fitted with heavy steel propeller blades. The blades push the material toward the moving buckets, thus giving each a full load, and, at the same time, clear a path for the rear wheels as they slowly push the apparatus into the work. With one attendant working at the levers, this machine can load five tons of material in as many minutes.

MOTOR-TRUCK EXPRESS BOON TO FARMERS

Farmers living along the 110-mile route of a motor-truck express line that is operating between Portland and Salem, Ore., make use of the service regularly. They send their products to the cities and receive their merchandise from them by motor truck. Deliveries and pick-ups are made anywhere along the route. Two large trucks are used daily, and on busy days a third one, smaller than the others, is put on the road.

ROLL-FEED ATTACHMENT MAKES PUNCH PRESS AUTOMATIC

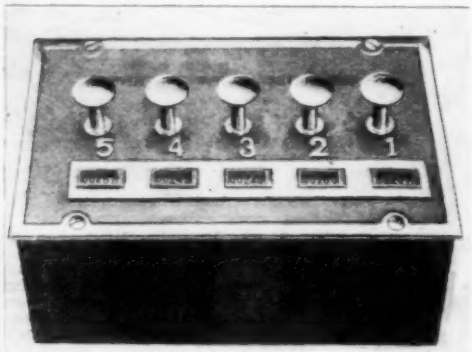
An attachment for power-driven punch presses, which straightens the stock, feeds it to the punch, and cuts up the scrap, makes such presses practically automatic, so that one operator can run two or three machines. The whole device is mounted on its own bolster plate, attachable to any press. The adjustable straightening rolls first take the curl out of coiled stock, which is then fed by large rolls, driven intermittently by a reciprocating rod actuating toggle-grip clutches. A pitman from the punch head moves the blade of the scrap cutter, the small pieces of scrap dropping into a box or barrel.



The Stock First Goes through the Straighteners at the Right, Then through the Intermittent Feed Rolls Driven from the Crank Disk on the Left End of the Shaft, and Finally through the Scrap Cutter

WAR-TAX SALES REGISTER COMPACT AND SIMPLE

Keeping a record of every sale in which war tax is involved is a stupendous task in the larger retail stores and in soda



This Machine Registers the Number of Sales Made at Each Different Tax Rate Up to Five Cents, and Is Especially Intended for Soft-Drink Dispensers

fountains, where each soft drink served means a few cents paid to the government. A small, simple, and accurate registering machine has been placed on the market to make easy the recording of such sales. Plungers, marked with the various amounts of the tax, operate a mechanism which shows the number of sales, up to 100,000, under any particular tax classification. The instrument is intended to be read as a meter by government officials.

PRIZE IS OFFERED FOR FIRST PORTUGAL-BRAZIL FLIGHT

A recent decree of the Portuguese government authorizes the gift of approximately $32,000 to the Portuguese or Brazilian airman who first flies from Portugal to Brazil. Spurred by the increasing use of airplanes and airships in other countries, Portugal is attempting in this way to establish a commercial air route to the South American republic, which has long been one of the chief purchasers of her products. The airmen who try for this prize will doubtless find it easiest to fly south from Lisbon to the Madeira, Canary, and Cape Verde islands, thence to lonely St. Paul's Rocks, and the Brazilian penal station at Fernando de Noronha, completing the 4,000-mile journey at Pernambuco, on the coast of Brazil.

STOP CONDENSATION ON PIPES WITH COAT OF GROUND CORK

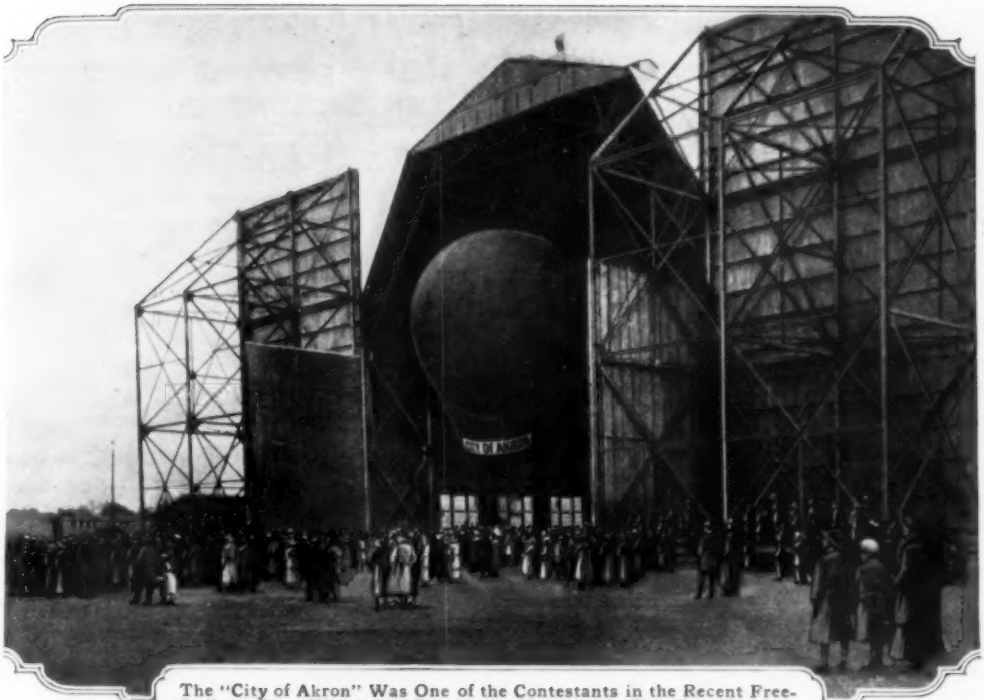
Cold-water pipes are prevented from condensing moisture on their surfaces by applying to them a coating of ground cork, in the experience of a water company in Pennsylvania. Over a first coat of common paint is spread a special cement paint, and dry granulated cork is applied by hand while the cement paint is still wet. Another coat of cement, and one of common paint, are added, allowing each to become thoroughly dry.

RECENT PERFORMANCES TEST AIRSHIPS

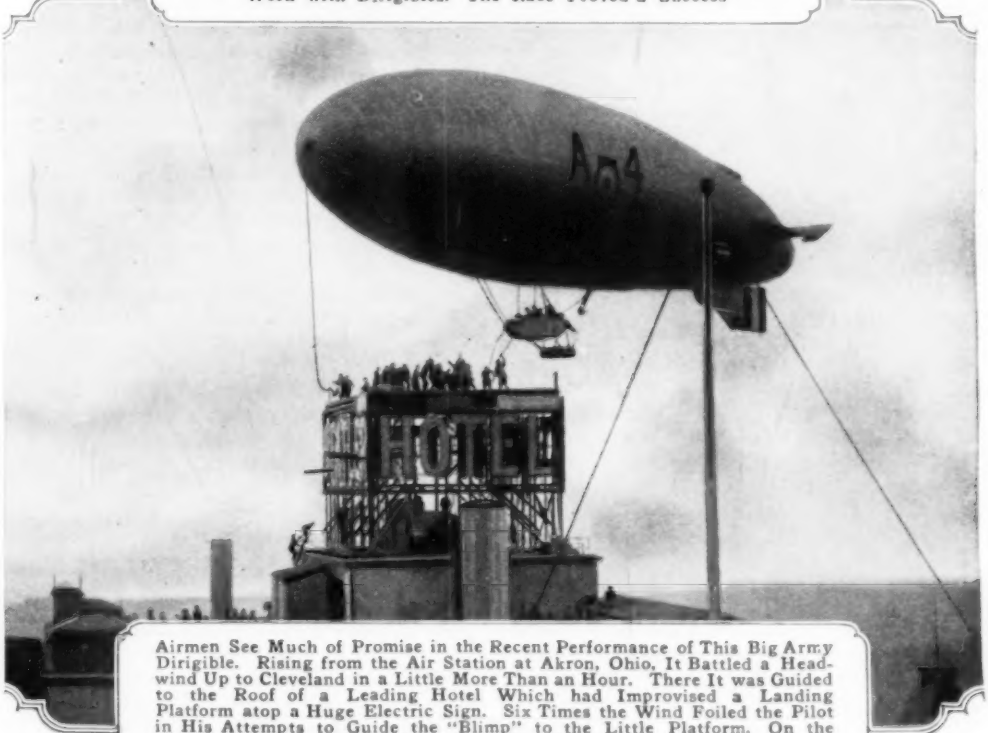
The airplane, with its sensational development, has lately monopolized public interest to the exclusion of the lighter-than-air machine. The air services of the army and navy have not been misguided, however, but have quietly continued their policy of impartial experiment with dirigibles and free balloons. Two recent events are typical in the satisfactory performances of the machines and in the instruction given the pilots.

The first was the feat of the "A-4," a 160-ft. rigid dirigible which landed on a 30 by 30-ft. platform erected on a hotel roof in the heart of Cleveland, Ohio. The craft left Akron in the afternoon, and, battling a stiff wind, reached the lake city in a little more than an hour. Controlling his ungainly craft with the utmost skill, and using every bit of his knowledge of wind velocity, the pilot was able to bring the basket to rest on the little platform on the seventh trial. From a commercial viewpoint, the performance ranks as one of the most significant in the history of dirigible navigation.

The second noteworthy lighter-than-air event was the revival of free-balloon racing, staged in Akron, Ohio. Seven bags were released on a Sunday afternoon, carrying pilots and meteorologists. Drifting eastward through snow and rain during that night and the next forenoon, the men were kept busy with their instruments and records. On Monday afternoon six of the balloons were brought safely to earth, some in Delaware, others in New Jersey and Maryland. The seventh bag was unfortunately brought down while passing over a steel-manufacturing district in western Pennsylvania. Four bullets from an unknown source ripped through the envelope, forcing the aeronauts to use all their skill in making the long drop.



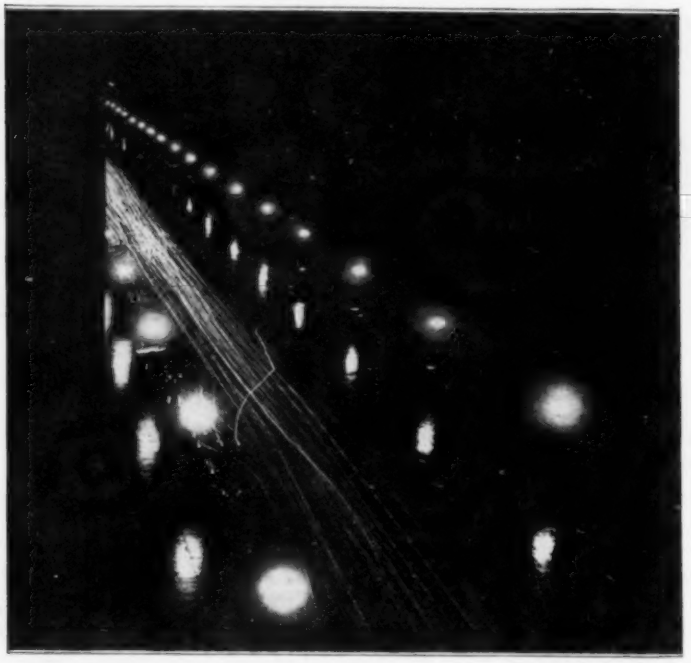
The "City of Akron" Was One of the Contestants in the Recent Free-Balloon Race Which has Reawakened Interest in This Once-Popular Activity. The Race Received the Whole-Hearted Support of Air Service Officials Who Realized Its Educative Value. Pilots Learn the Tricks of the Upper Air, and Become Familiar with the Management of the Big Bags, Thus Fitting Themselves for More Advanced Work with Dirigibles. The Race Proved a Success



Airmen See Much of Promise in the Recent Performance of This Big Army Dirigible. Rising from the Air Station at Akron, Ohio, It Battled a Head-wind Up to Cleveland in a Little More Than an Hour. There It was Guided to the Roof of a Leading Hotel Which had Improvised a Landing Platform atop a Huge Electric Sign. Six Times the Wind Foiled the Pilot in His Attempts to Guide the "Blimp" to the Little Platform. On the Seventh Trial He Was Successful

PHOTOGRAPHIC PLATE MAKES STRANGE TRAFFIC RECORD

A Chicago photographer has made an interesting analysis of traffic on Michigan Avenue by exposing a plate on a pitch-dark night. On development, only the glaring street lamps and automobile headlights were found to have made an impression. Across the plate the latter traced pencil-like lines, thick at a street intersection where traffic is required to slow down, but thinning almost to the vanishing point as the machines sped up for the next corner. All the traffic seems to be headed south, as the red tail lights of northbound machines made no impression on the plate.



This Picture of a Chicago Street was Taken on a Dark, Rainy Night. The Lines were Traced by the Headlights of Southbound Automobiles. The Red Tail Lights of Northbound Machines Left No Trace on the Plate

ESTABLISH BANK ACCOUNTS TO PAY EMPLOYES

A labor-saving and thrift-encouraging plan of paying his employes has been suggested to a large soap manufacturer in England and probably will be adopted. Under this plan the payroll is sent to the bank with which the firm transacts business, and the wages of each employe is placed to his or her credit in the form of a checking account.

LESSONS OF WAR REFLECTED IN DREADNAUGHT PLANS

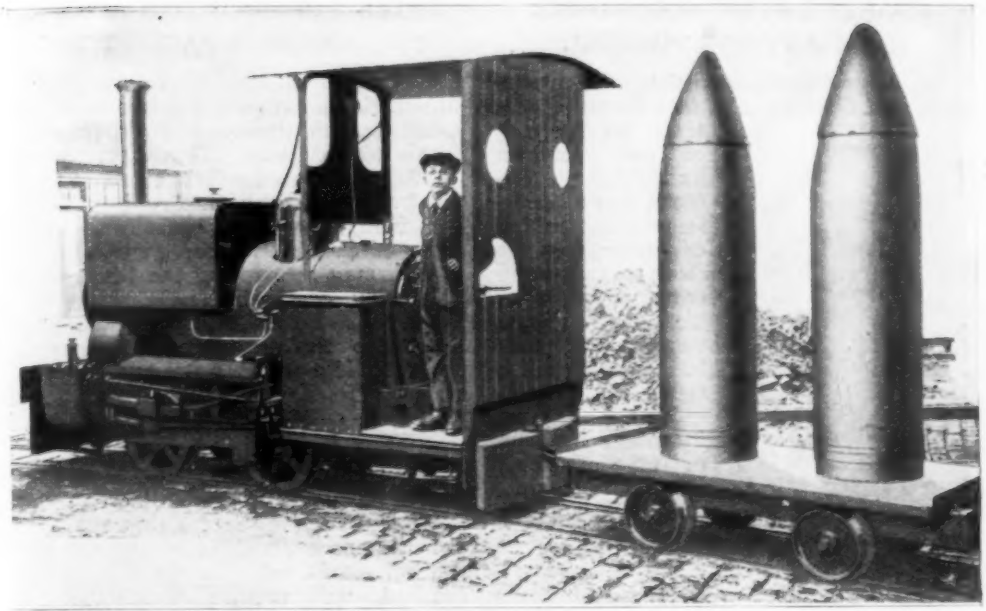
Lessons learned by the Navy Department during the war will be illustrated in the two latest dreadnaughts, the "Iowa" and "Massachusetts," bids for the construction of which were opened in Washington recently. These ships will be provided with the latest protective devices for use against mines and submarines, and will be equipped with mine-sweeping gear. They will be so divided by bulkheads and decks that it will be difficult to sink the vessels, even if a direct hit with a torpedo or shell is made. A ventilating system to guard against poisonous gases will be another feature. The displacement of the warships will be 43,200 tons each, their length 684 ft., and their breadth 106 ft. Speed will be 23 knots. Armament will include twelve 16-in. guns, sixteen 6-in. guns, four anti-aircraft guns, two submerged torpedo tubes, and a number of small-caliber guns.

EXCLUSIVE NEGRO TOWN BUILT IN VIRGINIA

Negroes only will be allowed to dwell in the new town of Truxtun, Va., built by the United States Housing Corporation to care for colored employes of the naval station at Portsmouth. There are 224 buildings in the town, accommodating 250 families and six stores. The latter will be operated by a stock company. Rents are very reasonable.

BRITISH NAVAL GUN FIRES WORLD'S LARGEST SHELL

Ever since Germany's monster howitzers shattered Belgium's "impregnable" forts in the black days of 1914, many minds have been fixed in the belief that the Huns alone possessed this superartillery. At that time such was indeed the case; but the allied nations were quick



These Two Armor-Piercing Shells Total Three Tons in Weight, Yet They can be Hurled 30 Miles by Great Britain's Monster 18-Inch Naval Gun. At the End of Such a Journey They can Penetrate a Wall of Ordinary Steel Armor One Foot Thick, Emerging Unbroken on the Other Side. At Point-Blank Range It is Computed That They will Similarly Pierce a Wall of Unhardened Steel Four Feet Six Inches Thick

to learn, and soon were quietly manufacturing still larger and more terrible weapons, so quietly, in fact, that little is known of these guns even now, save that they exist. It is stated, however, that the British 18-in. naval gun is the largest in the world. At its extreme range of 30 miles it is said to penetrate and emerge unbroken on the other side of an ordinary steel armor plate, 1 ft. in thickness. At 10 miles it similarly pierces almost 2 ft. of hard-faced armor; and at point-blank range will pass through a wall of unhardened steel 4 ft. 6 in. thick.

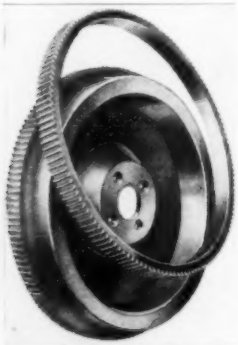
MOTORCYCLE TOOL SHOP HAS POWER-DRIVEN EMERY WHEEL

One mechanic finds that he gets many additional jobs since he has equipped his motorcycle as a traveling machine shop. On the sidecar, he has fastened a small vise, and inside has fitted four drawers which contain his tools. Most unusual, however, is the emery wheel which he has mounted on top of the gasoline tank. Arriving at the scene of a job, he stretches a belt from the grinder to a pulley on the main shaft of the engine. Starting his motor with the transmission in neutral, he has at his disposal a power-driven emery wheel which will grind almost anything.

By Driving the Little Emery Wheel with Power from His Motorcycle Engine, This Mechanic Is Able to Respond Quickly to a Request for Almost Any Sort of a Grinding Job

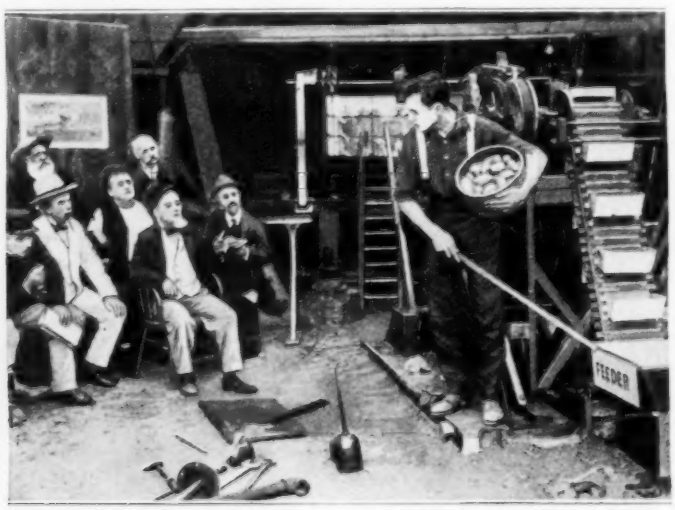
STARTER STEEL-RING GEAR FITS AUTO FLYWHEEL

Investigation of automobile-starter trouble often discloses the fact that the gear teeth on the rim of the cast-iron flywheel have become worn, making transmission of power from the electric starting motor unreliable. To remedy this, a western concern has brought out a steel-ring gear, which may be fitted on the rim of the flywheel after the worn gear teeth have been removed in a lathe, the mechanism thus being made as good as new.



POTATO-PEELING MACHINE SHOWN IN MOVIE

A huge and complicated machine for peeling potatoes was shown in a recent motion-picture play. The mechanism, designed by stage carpenters, was a mass of wheels, chains, and sprockets, with a scoop conveyor that carried the potatoes into the machine. An electric motor supplied the power. The potato peeler looked very impressive, but soon proved that it was hardly a practical machine.



This Burlesque Potato-Peeling Machine Looked Very Competent, but It Was Only One of the Properties of a Motion-Picture Studio

PRIZE OFFERED FOR AIR TRIP ACROSS PACIFIC

A prominent motion-picture producer has made an unusually generous offer to encourage an attempt at flight from California to Australia. The largest prize of $35,000 will go to the first airman to reach Australia from Venice. Provision is made for failure by two consolation prizes. One, of $10,000, will be awarded to the first airman attempting the flight who is able to fly only as far as the Hawaiian Islands. The second, of $5,000, will be presented to the airman making the best showing, if a number try and all fail.

BRITAIN'S TIMBER SUPPLY TO BE REPLENISHED

War has depleted the United Kingdom's forests to such an extent that the British government is planning to afforest 1,770,000 acres of land. To do this, it is estimated, will require $73,000,000. The planting will be done during a period of 80 years, 250,000 acres to be set to trees the first 10 years. Nearly 200,000,000 board feet of soft-wood lumber will be necessary for building purposes in England this year because of the shortage of dwellings.

RADIO WAVES IN WIDE BEAM PROJECTED AS DESIRED

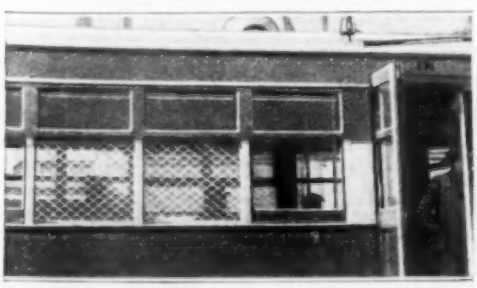
A recently developed form of wireless transmitter, announced in England, is arranged to project its waves in a divergent beam, like a searchlight. Its impulses, therefore, may be received anywhere within a certain area, or, by concentration, at a predetermined point. A proposal for the use of this quality contemplates the vertical projection of a wide beam carrying a set phrase, so that the pilot of an airplane, passing overhead, would be automatically notified of his location, receiving names, warnings, or directions through his head receiver. The phrase would be repeated at short intervals.

GAS FAILS: BORROW ACETYLENE TO KEEP NEWSPAPER GOING

Newspapers are huge consumers of gas, using it to melt the supply of metal constantly required by the linotype machines. Recently, in a Tennessee city, the gas service failed for several hours, just as the daily paper was in the throes of going to press. The startled but resourceful staff met the emergency promptly. Two cylinders of automobile-lighting acetylene were secured from a neighboring garage, and a larger cylinder from a welding shop near by. With this substitute fuel, which is a better heat producer than the city gas ordinarily used, the paper issued on time, and without trouble; and the edition gave credit, in a black-face line, to the relief contributed by the borrowed acetylene.

AUTOMATIC WINDOW SCREENS FOR STREET CARS

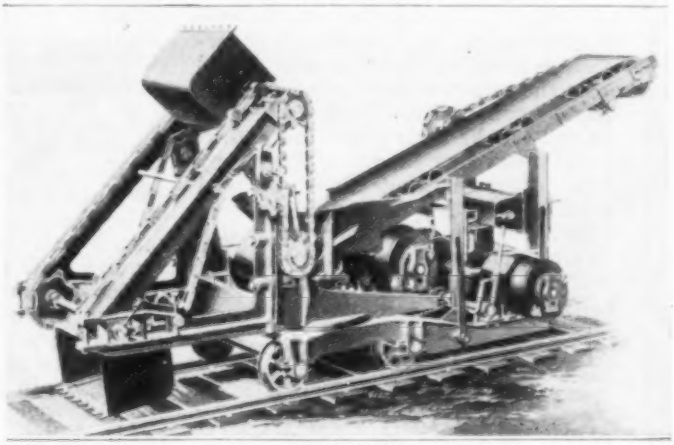
A street-car window screen that is always operative has been recently designed. Whenever a window is raised, the screen automatically comes into position, being fastened to the bottom of the window and raised and lowered with it. This makes it impossible for a person to put his head or arms outside of the window, and there is absolutely no chance for a passenger to get hurt. When the window is in normal position, the screen fits between the double side walls of the car.



Here Is a Safety Feature Which Is Entirely Simple Yet Automatic and Efficient. A Wire Screen, Just the Size of the Car Window, is Attached to Each at Its Lower Edges. As a Window is Raised the Screen Follows

SCOOP LOADER FOR MINES IS SELF-PROPELLING

Designed to work within the space limitations of underground mines, a new scoop-loading machine is both operated and propelled by a pair of 230-volt direct-current motors. The two steel scoops, with renewable toothed-edge portions, run continuously on an endless chain, the whole digger head swinging in an arc at the will of the operator. An inclined belt conveyor at the rear is fed by a hopper and discharges the excavated material into a car. The frame is all steel, working parts being protected from dirt and water.



In This Scoop Loader, Particularly Adapted to Mine Use, the Scoops Work Continuously on Their Chains, and the Digger Head Swings from Side to Side on Ball Bearings. The Loading Conveyor Is at the Rear and the Motors under It

BRASS NUT AND TWO PENNIES MAKE CIGARETTE LIGHTER

An ingenious amateur mechanic has made a pocket cigarette lighter of decidedly ornamental appearance by the simple means of soldering two English pennies to the sides of a big hexagon brass nut, thus forming a container for the spirit. The steel friction wheel, and the wick and filler plug, were mounted in two holes in one flat side of the nut. Dishing the pennies to form convex sides added to both appearance and capacity.

SCHOOLGIRLS GIVE FRENCH PREMIER GOLD PENHOLDER

BY COURTESY OF L'ILLUSTRATION

To express their joy in M. Clemenceau's recovery from the recent attempt at assassination, the girls of a Paris high school resolved to send him a bouquet of flowers. A collection was taken, and it was found that the pupils had given with unexpected generosity. They decided at once to make their gift more enduring; and finally hit upon the happy idea of presenting their beloved premier with a gold penholder with which to sign the treaty of peace. It was delivered a short while ago, with all ceremony, by a delegation of the schoolgirls.

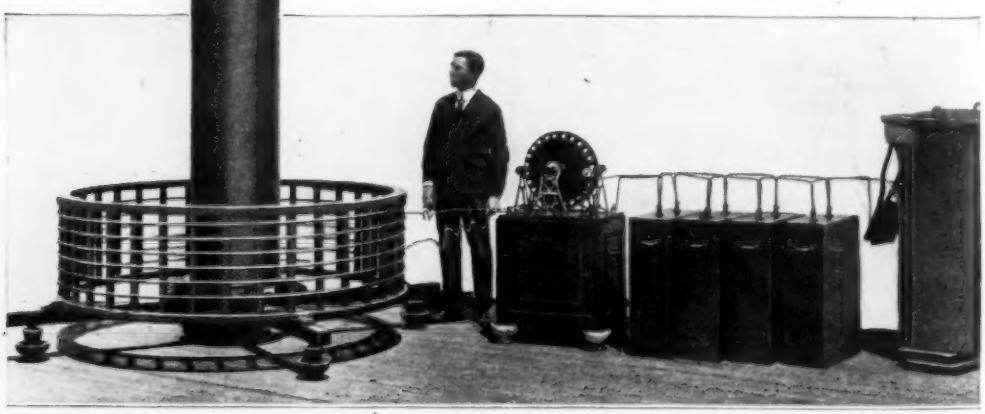
LIGHTNING MADE FOR MOVIE SCENES BY HUGE COIL

The weather in southern California recently continued fair and cloudless for so many months that the managers of a great motion-picture studio became impatient. Several scenarios called for rainstorms, with lightning and all the other fixings. Rain they could easily imitate, but for lightning they had to turn to their electrical engineer. He responded with a $10,000 electrical machine that rivals the product of J. Pluvius at his best. The commercial voltage is raised by a transformer, which delivers 75 kw. at 40,000 volts. This current passes through four large condensers, through a rotary spark gap, and into the primary windings of the huge coil. The secondary winding stands 6 ft. high by 2 ft. in diameter, and contains 14,000 ft. of wire, giving a spark or breakdown radius of ten feet.

TANDEM MULTIWING AIRPLANE SEEN AS FUTURE AIR LINER

Airmen have been interested lately in a reawakening of the old discussion of the maximum practical size and design of the future long-distance airplane. It is pointed out that commercial transatlantic planes with their large loads will certainly require 10,000 sq. ft. of wing surface. The problem becomes one of increasing wing surface without impairing flying qualities. A biplane with this great lifting surface and a span of 170 ft. would have to have a wing depth of almost 30 ft., making the plane unwieldy and tremendously inefficient. Piling one wing above another is also unsatisfactory, as these towering multiplane structures are top-heavy and liable to somersault on landing. So it seems possible that the monster superairplane of tomorrow will be a tandem machine; for instance, a quadruplane with one pair of wings in front and the other behind. If this arrangement does indeed find favor, the "old-timers" will chuckle as they remember that machines of exactly that type were flown, and discarded, years ago.

¶ Rich deposits of potash, discovered on the island of Sicily, are said to remove forever the world's dependence on Germany for that substance.



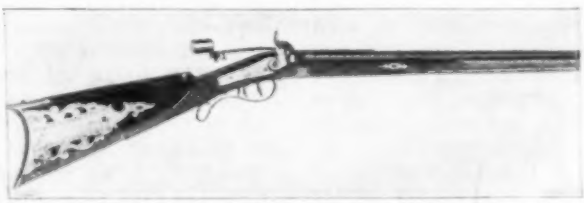
This Is the Motion-Picture Studio's High-Frequency Coil Which Furnishes the Lightning Effects in All the Storm Scenes Required by the Scenario. The Current Passes, from Right to Left, through the Transformer, through Four Large Condensers, through a Rotary Spark Gap, and into the Primary Windings

SMOKELESS POWDER

By CLARENCE F. ALLEN

WE are all familiar with the story of the old lady who was ready to believe in mountains of gold and rivers of rum, but would take no stock in flying fishes. Popular beliefs are often equally erroneous. No doubt the outstanding feature of "T. N. T." in the popular mind is one of power, yet there are blasting compounds perhaps twice as strong, hence the real virtues of that famous explosive must lie elsewhere.

Similarly, the popular conception of smokeless powder is doubtless that of a gunpowder which very obligingly burns without smoke. This belief, unlike those just mentioned, is practically correct as far as it goes, but experience shows that the advantages of smokeless powder are greater than the name implies. Touch a match to a bit of black powder and a miniature explosion follows, but the same treatment accorded smokeless merely causes it to burn slowly away; in fact, some brands may be difficult to ignite with a match. It is evident, therefore, that smokelessness is not the only distinguishing characteristic of the powders. If one happens to be a sportsman, a day in the open with his favorite weapon will bring to light still further differences. Thus, if the ammunition is of the old black-powder variety, a few shots will foul the bore so badly that to secure further accuracy, he will have to stop and clean it and repeat the cleaning every few shots, while with smokeless ammunition he may shoot all day without cleaning and leave this work until he gets home. Again, in reloading shells in which black powder has been used, it is necessary to wash the shells thoroughly inside and out before reloading, and even then, they will present a dirty and discolored appearance, and with continued use will gradually become so fouled inside that they will no longer take the proper load of powder. On the other hand, with most smokeless powders the shells will need no cleaning, and reloading simply requires the punching out of the old primer, and the insertion of a new one, together with powder and bullet.



Before the Era of Smokeless Powder, Firearms Were Much Heavier, on the Average, than They Are Now, "Kicked" Harder, and Needed Cleaning Every Few Shots to Maintain Accuracy

In addition to these advantages smokeless powder is more powerful than black, so that a smaller quantity will give the same ballistic results as a much larger amount of black. With some smokeless powders a load equal to one-third the usual charge of black, will give the same results as the normal load of black, while with others, a mere pinch dropped in the bottom of the shell will produce results equal in velocity and energy to a full load of black powder. Much depends upon the weapon and the powder adapted to it. In any case, this greater power may be taken advantage of to get equal results with less powder or to get better results by increasing the powder charge. If the weapon happens to be a rifle of the old black-powder type, it is possible, without danger and by simply using smokeless powder and a metal-case bullet, in place of the old lead one, to secure an increase in velocity of from 400 to 500 foot-seconds, and since the energy, or power, varies as the square of the velocity, this is a very appreciable increase in power. If the weapon is especially adapted to smokeless powder (like the so-called high-power rifles) one may go still farther, and even double the velocity. This increased speed not only makes for much greater power but gives a much greater "point-blank" range, and subjects the bullet to wind and like atmospheric disturbances for a shorter time—all of which makes for greater accuracy. (It does not seem to be generally understood that a bullet fired from a gun held in a horizontal position, as in ordinary firing, will fall to the ground in the same time as one dropped from the muzzle. There is therefore, in theory, no such thing as "point-blank" range, but in practice, a bullet flies some distance before its drop is noticeable.)

A bullet traveling at the rate of 1,000 ft. per second is moving more slowly than sound, hence if one is standing at the target he will hear the report of the gun before the impact of the bullet. Modern velocities are in the neighborhood of 3,000 ft. per second, so that at a good

distance, there is a very noticeable interval between the time of hearing the impact of the bullet and the later report of the gun. In fact, there is almost as much difference as there is in the case of a bullet traveling so slowly one can watch it to the vanishing point. The writer once loaded some pistol cartridges with large round ball and a very small charge of powder, with the result that the bullets traveled like a stone thrown from the hand and could readily be seen en route. In this connection it is perhaps proper to say that if the bullet is large enough, or the conditions favorable, a much higher velocity will not prevent a glimpse of the bullet in flight. The shell from a 12-in. mortar can readily be seen tearing through the air; likewise it can most certainly be heard. High velocity has one curious disadvantage, however, in that a rifle fitted with one of the modern inventions known as a silencer cannot be made silent if the bullet's velocity is greater than that of sound. In other words, there is gun noise and bullet noise, and only the first can be silenced. At velocities below that of sound (about 1,100 ft. per second) the trouble disappears, and under favorable conditions, the report is so silenced that the fall of the hammer may be heard as if the gun had misfired.

The Modern Smokeless, High-Power, Automatic Repeating Rifle Is Light, Has Little Recoil, and does Not Readily Foul, Even When Firing a Shot a Second at Velocities Unheard Of with Black Powder

Smokeless powder also seems to give less recoil than black, this being particularly noticeable with the small-bore, high-velocity loads, which give much greater range and energy than the old-style weapons, yet have much less "kick." They are more pleasant to shoot, accordingly. The reduced recoil has made for lighter weapons, so that while rifles once weighed as high as 16 lb., a modern sporting weapon need not weigh over 7½ lb., and many are lighter. Similarly, military weapons, capable of firing five shots in about as many seconds, are lighter than the old type, which could hardly average one shot in that time. Incidentally, they are more powerful, there being few, if any, that will not put their bullets through the blade of an ax, and "then some." The penetration in wood is several feet. Hence the old log forts would offer little protection against the modern rifle bullet.

Of course, all these improvements have not been gained except at some expense and trouble. Modern rifles must safely stand a pressure of 50,000 to 60,000 lb. per square inch; the pressure of the atmosphere is about 15 lb., which affords some means of comparison.

As tests by the Ordnance Department showed that barrels would not stand a sustained (hydraulic) pressure of much over 35,000 lb. per square inch, it is evident that only the brief period during which a rifle barrel is exposed to high pressure saves it and, perhaps, the shot from destruction, when cartridges giving as high as 50,000-lb. pressure are used; one might almost say they don't have time to burst. The temperature, too, like the pressure, goes skyward upon the firing of the cartridge, and mounts into thousands of degrees Fahrenheit, so that for this reason also, it is only the shortness of the exposure that saves the barrel, since the temperature is far above the melting point of steel. It seems paradoxical, therefore, that a rifle may be fired many thousand times before the wear and tear is of sufficient moment to affect its accuracy—and that, even then, only an expert can detect the difference.

Smokeless powder, therefore, is not only smokeless, but as much of an improvement upon black as present-day electric light is upon the old-time candle.

WIRELESS MAY CAUSE FIRE IN INFLAMMABLE GOODS

That highly inflammable substances, such as oily waste and cotton, may be ignited by sparks developed from wireless impulses, is the claim of a French scientist. The theory was experimentally demonstrated by the construction of a resonator whose discharge readily set fire to various materials. The increasing use of high-powered radio equipment points, in this light, to a possible new element in the problem of fire protection.

¶An American manufacturer is now producing a cheap, seamless copper tubing for use as an elastic gas connection.

Pay-Roll Robbers will have to Arm Themselves with Light Artillery if They Wish to Rob This "Bandit-Proof" Auto Truck. Designed for the Transportation of Large Sums of Money through the City Streets, the Truck Body is Made of Steel Plates, Riveted Like the Sides of a Ship. Bars Cover the Doors and Windows

CITY BANK DELIVERS MONEY IN ARMOR-PLATED TRUCK

The bold knights who once rode about the lawless countryside in clanking suits of armor plate seem quite amateurish now, when compared with the agents of a Chicago bank who fearlessly haul money through the city in an armor-plated truck. The truck body resembles that of a patrol wagon, with steel bars across windows and doors, and a steel pilot house provided for the driver. The steps at the side and rear fold flush with the body as the doors are closed.

NEW AIRPLANE AMBULANCE HAS REMOVABLE FUSELAGE BOTTOM

Forced to the ground and seriously injured during a cross-country flight, many an airman has found that the miles which slipped by so smoothly in the air seem 10 times as long during the trip back to camp in the jolty ambulance. Although the airplane ambulance has naturally been recognized as the remedy for this condition, mechanical difficulties have previously forbidden its general use. But in the construction of the latest aerial ambulance, these difficulties seem to have been largely overcome. The ambulance pilot now flies single-handed to the scene of the accident. Landing near the unfortunate airman, he steps out of his machine and lowers the bottom of the fuselage, revealing a comfortable wire stretcher. Placing the victim in the stretcher, the latter is raised by turning a crank at the side of the fuselage.

The Pilot of This Aerial Ambulance is Seen Turning the Crank Which Raises the Fuselage Bottom and Lifts the Stretcher into Traveling Position. This Mechanical Arrangement Is Superior to Previous Methods, Which Necessitated the Presence of at Least One Attendant

OLD PALM TREE TRANSPLANTED AS CIVIC LANDMARK

Few busy passers-by gave more than a glance at the sturdy old palm tree which recently grew in a back street of a California city. Still fewer realized that the old tree had stood there since the days of '49. Here and there were those who loved the old landmark, however; and when it was decreed that the tree must make way for a new business block, they had it carefully dug up and transported to another site. This operation was no small task, as the moving company estimated that the roots alone weighed four tons. The expense of the transplantation amounted to about $250.

This Old California Palm Tree was Considered Such a Landmark That It was Recently Moved to a New Site, Two Blocks Away, to Make Room for a Business Block. About $250 was Paid for the Awkward Operation

FIRE ALARM IS OPERATED BY LIGHT OF FLAMES

Based on the well-known effect of light rays upon selenium, a European inventor has devised a fire-alarm system declared to be so sensitive that the light of a match 20 ft. away will set it off. A selenium cell is placed in series with a battery and a relay, the latter actuating an alarm bell. When the light from an incipient blaze falls upon the selenium, its electrical resistance becomes so reduced that current from the battery passes through it. In tests, it was found that the bell rang, as a rule, within 10 seconds after the fire started. The least illumination that a burglar could possibly work with also sounded the alarm.

ELECTRIC FURNACE SHORTENS MAKING OF GUN STEEL

Use, for big-gun manufacture, of steel made in basic open-hearth furnaces, previously considered worthless for the purpose, was one of the noteworthy technical developments of the war. All ordnance specifications were satisfactorily met by one American ordnance manufacturer with basic-process metal, and a British producer was wholly successful with a plain carbon steel electrically fused, despite the fact that three-percent nickel alloy was the standard. The acid process, customarily used because of the purity and reliability of its product, takes about three times as long as the electric-furnace method of refining, and the latter process was demonstrated to produce a metal as good, if not better, for gun making, in spite of the old prejudice against it.

SAFE WEIGHING TEN TONS CUT INTO SECTIONS

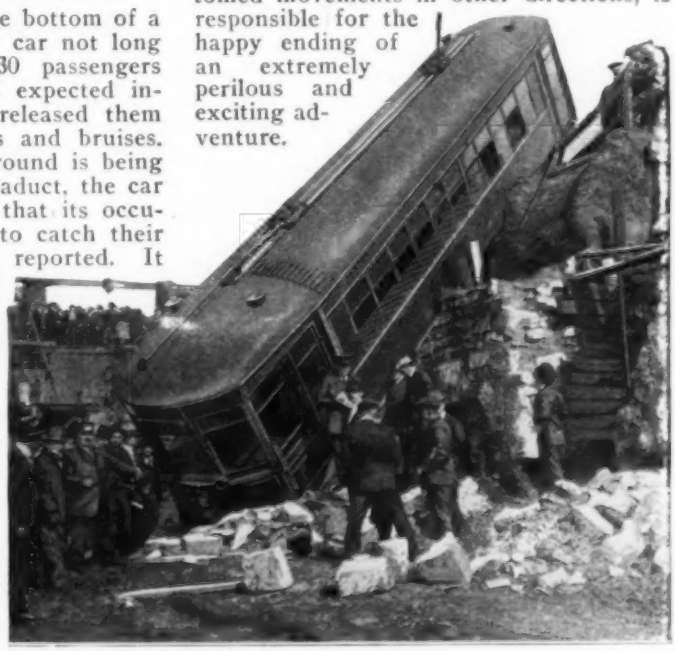
A large safe, weighing 10 tons, had been placed in the vault of a bank at New Brighton, Pa., before the door of the vault was set. When the safe's removal was desired, it was found too large to pass through the opening, so it was decided to cut it into sections. Thirty hours of work with an oxyacetylene torch were required, to cut through the ten layers of ⅜-in. steel of which the safe was constructed.

Sections of Steel Safe, Cut Up by Oxyacetylene Torch to Permit Its Removal through a Narrow Door: The Torch Cut through Ten Thicknesses of Three-Eighths-Inch Steel

View from the Street after the Accident, with the Rear of the Car Tilted High in the Air. Passengers were Rescued from This End by Rolling a Wagon underneath It. The Rear Truck, Which Rested at the Edge, may be Seen Just below the Body

STREET CAR DIVES INTO PIT UNHARMED: NO CASUALTIES

In a headlong dive to the bottom of a 25-ft. pit, a Chicago street car not long ago carried more than 30 passengers through all the horror of expected injury or death, and then released them with only a few scratches and bruises. Opposite a point where ground is being excavated for a railroad viaduct, the car left its track so suddenly that its occupants had no time "even to catch their breath," as the motorman reported. It made a short turn, shot over the brink, and dropped to the bottom of the chasm without varying from its even keel; and there it stood, propped at an acute angle against the side, its seats in this position forming shelves which kept the passengers separated until they were rescued from both ends. Cool heads among them managed to allay the natural sense of panic. The car itself was practically undamaged. The fact that it did not lose its lateral balance, with all its unaccustomed movements in other directions, is responsible for the happy ending of an extremely perilous and exciting adventure.



The Car's Nose Rested on the Bottom of the Pit in This Position, Still on an Even Keel and Practically Undamaged by Its Dive. Some of the Passengers Escaped through This End

WOMAN ENJOYS DAILY FLIGHT DESPITE HER 86 YEARS

Old ladies will never amaze the world as stunt pilots; but nothing seems to

This London Woman is 86 Years Old, Yet She Flies Almost Daily with Her Son, Himself over 50 Years. In the Photograph She is Shown at the Start of the First Flight

stand in the way of an occasional airing in the passenger cockpit of a trustworthy biplane. Anyway, that is the belief of a London woman who is 86 years old. Some weeks ago, at a field near London, she was given her first airplane ride by her son, himself over 50 years. Since that time she has insisted on a flight every day the weather permitted. A better proof of the safety and convenience of flying could probably not be found.

UNDERGROUND TORPEDO DIGS ITS OWN TUNNEL

Added to the list of interesting but tardy war inventions is a so-called "earth torpedo," of Canadian origin, which bores its subterranean way undetected toward the enemy lines, and then explodes with great force. The burrowing operation is hydraulic. The nose of the torpedo is equipped with an ingenious boring nozzle, and takes with it a length of hose, which a pump in the trench supplies with water at 300-lb. pressure. This part of the performance is silent. In a test, the device burrowed for 200 ft., and then blasted out an excavation 20 ft. across.

SPILLS SUPPLY THRILLS IN MOTORCYCLE CLIMB

Two motorcycles went over the top in the fourth annual Devil's Despair Hill-Climbing Contest at San Juan Capistrano, Calif., recently. The 500-ft. course up a grade varying from 50 to 76 per cent was topped by one machine in the stock-machine event, and by another in the free-for-all, in which machines of unrestricted mechanical design were used.

There were 22 machines in the stock event and 30 in the free-for-all, and each rider had two trials at the hill. The grade was so steep that nearly all machines that failed to make any appreciable showing either turned over backward and somersaulted down the grade, or dug their rear wheels into the ground until they could move no farther. Broken drive chains accounted for the fact that 50 per cent of the machines failed to make the grade.

Nearly all of the motorcycles were provided with rear wheels fitted with great steel strakes. They would go plowing up the course, roaring like locomotives, and throwing up clouds of dirt. Then the front end would rear high in the air and the machine would hurtle over backward. Almost invariably the rider would slide off over the rear mudguard as soon as the front wheel began to rise, and as he struck the ground would roll as far as possible down the hill to avoid the falling machine as it would come thundering down after him.

With all the hair-raising spills that were taken, it is remarkable that no rider was seriously injured. Several were bruised and scratched, and one spectator sustained minor injuries when a machine turned off the course and ran wild among the crowd. The fact that the riders all escaped injury was due to the remarkable skill they have acquired in rolling clear of the falling machines once they are thrown off.

Dudley Perkins, of San Francisco, who won the free-for-all contest, pocketed $100 as first cash prize. There were also miscellaneous money prizes that brought his total winnings to $750. Orval Healton, of Santa Ana, Calif., winner of the stock event, pocketed a similar sum of money. There were miscellaneous other prizes varying down to $15 for the first five contestants making the best showings in each event. Perkins' time over the course in the free-for-all was 34⅘ seconds. No scoring of time was taken into consideration in the stock event. A crowd variously estimated at from 15,000 to 25,000 persons witnessed the climb.

Halfway up the Hill, One Hard-Pressed Machine Executed a "Bucking Broncho" Movement, but the Rider Got Back into the Saddle and Finished the Run

The Speck Halfway up the Long Incline Is the Winner of the Stock Event. Devil's Despair Hill, at San Juan Capistrano, California, Is the Scene of an Annual Motorcycle Hill-Climbing Contest, the Course of Which Is 500 Feet Long and Very Steep. The Winner's Time in the Free-for-All Contest Was 34½ Seconds

The Winner of the Free-for-All Contest Turned Over Backward in His Second Trial. This, However, Was by No Means an Uncommon Performance on the 50 to 76-Per-Cent Grade, Though None of the Riders was Injured

The Stock-Event Winner in His Final Spill as He Crossed the Tape, Giving a Good View of the Heavy Steel Strakes on the Rear Wheel: All Contesting Machines were So Equipped

LAUNDRIES FOR AUTOMOBILES THRIVING IDEA

A new form of service to motorists promises to solve at least one problem of the owner of an automobile. In fact this

The Legend on the Shop Windows Indicates the Nature of the Industry Pursued Inside, Where Autos are Cleaned and Polished "While You Wait" in a Comfortably Furnished Reception Room

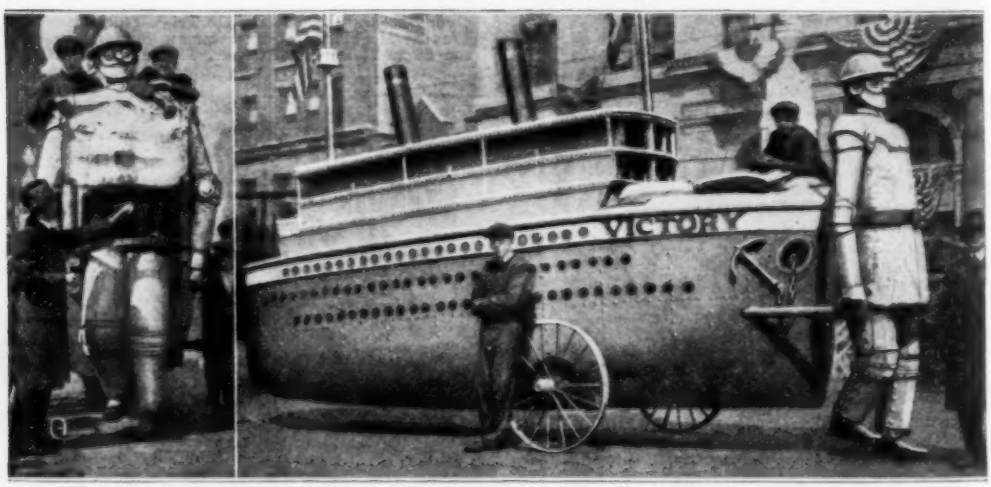
laundry for cars is the latest by-industry of motordom. While the patron waits comfortably in a room furnished with lounging chairs, library tables, reading matter, and decorative palms, his car is being washed and polished to immaculateness, in the shortest amount of time. An enterprising colored man in the West is believed to be the originator of this type of business.

HOLLAND TO HOLD COMMERCIAL AERONAUTICAL EXPOSITION

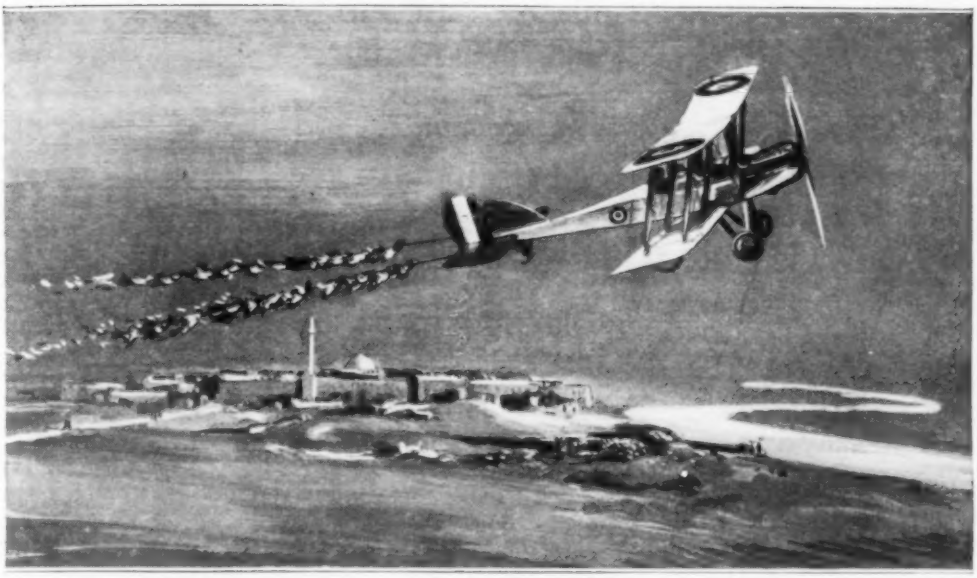
An international aeronautical exposition will be held at Amsterdam, Holland, during the months of July and August. As many requests for space have already been received, the directors feel assured that foreign manufacturers will participate on a large scale. Space will be granted to machines of every design and purpose, except that no planes intended solely for military use will be displayed. The exposition was inaugurated on the 5th of July.

GIANT MECHANICAL MAN WALKS CITY STREETS

For centuries mechanicians have busied themselves with mechanical figures, or automatons, which could imitate the actions of men and beasts. They have devised mechanical butlers, flute players, buglers, tambourine players, and chess players; but it remained for an American inventor to build the steel pedestrian which draws along the city streets a wheeled float weighing more than a ton. The inventor is said to have devoted $15,000 and six years of experiment to perfecting the work. After several failures he adopted the present system of gears, cams, and cranks operated by the 20-hp., four-cylinder engine in the float. The big fellow is controlled quite like an automobile, with a throttle, clutch, and steering wheel. He is 12 ft. high and weighs 2,500 pounds.



This Iron Man has Marched with His Ship in Many City Parades. The Inventor Spent Thousands of Dollars and Several Years of Experiment on Previous Unsuccessful Figures, Finally Designing This Giant Which Weighs a Ton, and is Driven from the Ship by a Regular Set of Automobile Controls. At the Left the Inventor has Removed Part of the Coat to Permit Lubrication



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AIRPLANE RETURNS FROM POULTRY MARKET WITH PURCHASES FLOATING BEHIND

THE ancient land of Mesopotamia resounded to the tramp of marching armies more than 2,000 years before the Christian era. And since that time the walls of the old towns along the Tigris and Euphrates have looked on the strange ways of many an invader. Yet never before the recent British campaign against the Turks had they seen two strings of dead fowls rise from the market place and float away. A British airman was responsible for this unusual method of transporting supplies. He tied his purchases together in two long strings, fastened them to the tail of his machine, and flew home trailing the novel streamers.

DREAMS OF SHELL-SHOCKED GIVE CLUE TO CURE

Cases of shell shock and army nerves are being treated by an officer of the British medical corps through study of the patient's dreams. The afflicted man is persuaded to relate the features of any nightmares or other dreams, concentrating particularly upon the emotional recollections. The observant physician is able to identify, by the expression of the subject and sometimes by symptoms of terror, the exact nature of the disturbing vision, and thereby to adopt means to combat its influence.

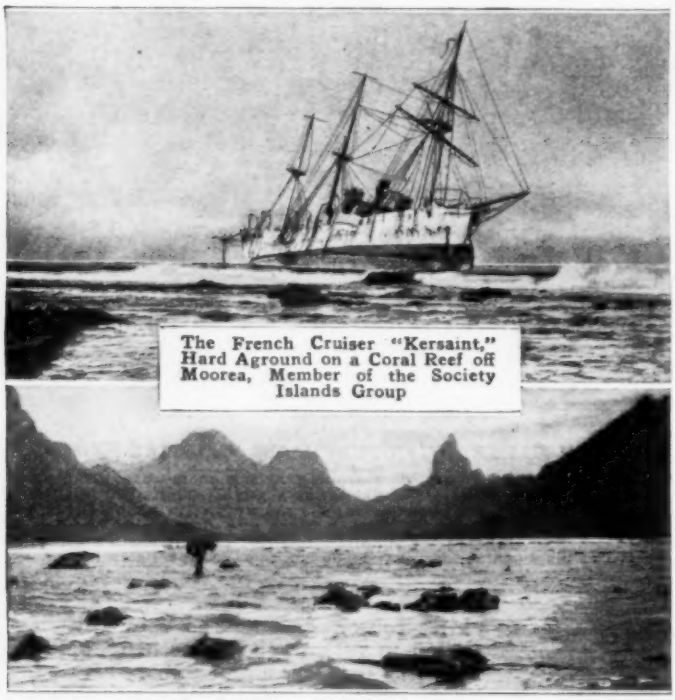
REPAIR-EQUIPMENT STATIONS ALONG ELECTRIC RAILWAY

Most travelers have noticed the spare rails which are placed at intervals along every railroad's right of way. Quite unusual, however, is a similar idea adopted by a suburban trolley line to expedite repair work and lighten the task of the electrician. Repair equipment, consisting of an extension ladder and a heavy vise, is stationed at convenient points along the entire route, enabling the company electrician to rush to the scene of trouble on his little speeder, unencumbered by such heavy units. Finding ladder and vise always close at hand, he is seldom forced to ask the assistance of the repair car.

Stationed at Intervals along the Route of a Suburban Trolley Line, These Repair Units have been Found to Hasten and Lighten the Work of the Electrician

FRENCH SHIP RUNS AGROUND ON SOCIETY ISLANDS REEF

On a reef off the rocky coast of Moorea, rugged and mountainous member of the Society Islands group in the South Pacific,



The French Cruiser "Kersaint," Hard Aground on a Coral Reef off Moorea, Member of the Society Islands Group

Opunohu Bay, Island of Moorea, Just Outside of Which the "Kersaint" Stranded: The Rocky and Mountainous Nature of the Island is Clearly Seen, as Well as the Shoals inside the Circle of the Surrounding Coral Reef—an Arrangement Characteristic of the Hydrography of These South Pacific Isles. The Lagoons of These Islands Usually Form Safe Harbors After the Passage through the Reef has been Made

the French cruiser "Kersaint" ran hard aground early this spring. Like most of these islands, Moorea is practically encircled by a submerged bar of coral, which, indeed, makes its harbors the more hospitable by protecting them from storm. It was at a point just outside of Opunohu Bay that the man-of-war failed to make the passage. Men and guns were readily landed, but lack of facilities on the island, whose population is less than 2,000, hampered attempts to right the stranded vessel. The "Kersaint" is a 1,243-ton ship, built in 1897, of 2,200 hp. and 15-knot rating.

¶ The French minister of liberated territories has reported to his government that 250,000 buildings were partly destroyed in the devastated districts, and that 300,000 were completely ruined.

HUGE OIL TANK IN SCOTLAND OF LEAK-PROOF CONCRETE

Built for American naval purposes, a capacious oil-pipe line across Scotland from the Clyde to the Forth now reverts to British uses. It has been improved by the construction of a 60,000,000-gal. concrete reservoir at Rosyth, on the Forth, whose remarkable leak-proof quality is credited to the unusual care and patient thoroughness applied to its erection. The mammoth tank is in two sections, the dividing wall built to allow their independent use, and is seated upon solid rock, of which 300,000 cu. yd. was excavated. The floor, 2 ft. 9 in. thick, was laid in checkerboard sections, alternate squares being allowed to set and shrink before the intermediate spaces were filled. The walls, 35 ft. high, were built in lengths of 54 to 58 ft., with a 3-ft. space between adjacent ends. This space was closed with a steel plate, extending from top to bottom, its edges imbedded in the walls, forming an expansion joint. Fine concrete filled the interstices around the plates and was applied also to the finished mass concrete of floor and walls. Rod reinforcing was used in the walls and expanded metal in the floor. Another wall 16 ft. high bisects each section of the tank. The whole is roofed over with arched timber construction supported on concrete pillars and timber posts. The roof area is 7⅓ acres, the reservoir with its surrounding roadway occupying 11¼ acres.

ALLIES IN RUSSIA CAMPAIGN AMID STRANGE SURROUNDINGS

For an entire month of this last spring, the allied troops stationed along the Murman Coast of northern Russia learned to go about their work with the thermometer registering 40° below zero, and with the sun below the horizon 20 hours a day.

A British Detachment from the Allied Expeditionary Force in Arctic Russia is Shown as It Drags a Light Fieldpiece along the Crusted Surface of the Snow. Below is Seen a Similar Piece Guarding a Lonely Outpost. Supplies Reached Many of These Outposts Only after Long Journeys by Reindeer Sledge

PHOTOS BY CENTRAL NEWS PHOTO SERVICE

They were kept in good health, however, by liberal issues of fur clothing, and the construction of well-lined log barracks, heated by Russian stoves. In addition, Major Sir Ernest Shackleton, the antarctic explorer, was attached to headquarters as an authority on arctic equipment, while a number of Canadians with experience in Klondike conditions were detailed as instructors in arctic life.

LITTLE TANK TRUCKS SUPPLY GASOLINE TO AIRPLANES

During a busy day at a large aviation field the amount of gasoline and oil consumed is enormous. The supply man at the wheel of his little tank truck, known as the "gas flivver," is kept busy darting from one thirsty plane to another. The filling apparatus used is of the portable type seen in every large garage, but is equipped with a hose of extra length to reach to the less accessible tanks of the bigger planes.

A Little Truck of This Sort Replenishes Gasoline and Oil Tanks at Every Large Aviation Field. The Plane About to be "Gassed" Is a Le Pere, One of the Government's Latest and Fastest Fighters

WATER—THE MAKER AND DESTROYER OF ROADS

By HARLAN H. EDWARDS

This New Monolithic Brick Pavement has been Broken by the Heaving or Swelling of the Wet Earth Below, Caused by Thawing of Frozen Ground

HIGHWAY construction is an art neither easily nor quickly acquired, but rather it takes years of study and experience for one to be able to build the best road in the best place. However, though highways and railroads seem to have little in common, many of us are prone to make the same mistakes in construction

Water Flows from Both Directions into This Low Place in a Road and Stays Until It Dries Up. Two Hundred Feet of Tile would Remove This Mudhole

that the railroad men did years ago. Hard-road construction in many places seems to be taking on the aspect of building heavy-slab bridges over the land—requiring 8 to 11 in. of solid-concrete slab—and neglecting more or less the most essential feature of good construction: effective drainage. One of our great railroad systems recently spent nearly $2,000,000 to provide adequate drainage for one of its divisions, with the expectation of recovering that amount in two years by decreased repair and maintenance expenses. Such work is equally effective on our highways. Get the water out of the road!

Water is as essential to the making of most roads as the road materials themselves, but an excess of it can destroy almost overnight the results of much careful work. It is not the flood waters in times of heavy rains that do the greatest damage, but rather the standing waters along the roads and the continual seep of underground water are the silent agents of destruction. More money is lost or wasted annually by neglecting to provide adequate facilities for drainage than it would take to build a wide, hard road across the United States, with connecting roads to every state in the Union.

Permanent foundations, having uniform bearing qualities, are essential to all types of engineering structures. Roads are no exception. These essentials, however, are impossible where, through accident, neglect, or design, side-drainage ditches are allowed to become blocked with earth or débris; tile drains clogged up or their outlets removed, or, in various other ways, the rapid removal of the excess water is stopped.

Water is as powerful as a high explosive, but does its work silently. By freezing, it can lift the heaviest loads, crack or break the heaviest paving slabs, and if permitted to saturate the soil under a road, it may reduce or totally destroy the load-carrying capacity of that road. It has been the ruin of many pavements which should have lasted for years.

Earth roads have been the greatest sufferers from water, and it is upon them that the greatest amount of money has been wasted. Whether through ignorance or neglect, much expense has been incurred in scraping the surface of the road when the trouble lay below the ground. Here and there along every road, we find small depressions in which water always collects, due to which the road at those

Such Holes as This Are Common on Our Earth Roads. A Corrugated-Metal Pipe Culvert (Seen at the Side) under the Road, Was So Near the Surface That It Collapsed under Heavy Loads, Cutting Off All Subdrainage

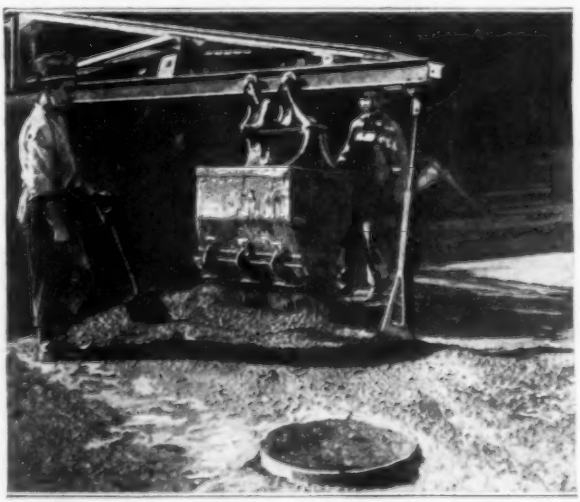
Wooden Culverts Are Seldom Satisfactory. At Best They Are but Temporary, and Become Dangerous Obstructions to Traffic

places is always a bog — a trap for motorists and a reducer of loads that can be hauled over the highway. A few dollars spent on deepening the side ditch through the high point of the road, or laying tile from that section to an outlet lower down, would permanently remove that obstruction to highway traffic.

This Road Had a Side Slope of About Two Inches to the Foot, Causing the Formation of Deep Ruts by Side Thrust of Automobiles. By Maintaining the Normal Crown of One Inch, This Condition would have been Avoided

A little farther along the road we may find a strip of road which is always soft, "rubbery," and rutted — the first to become impassable and the last to become fit for travel. It has always been that way. No amount of dragging or grading could improve it, yet a few lines of tile laid two to four feet deep here and there in the affected area, would have corrected the trouble. How many times have farm entrances been built through a side ditch without providing for the flow of water bound to occur at times; or if provided, how many times was it not made with thin metal pipes poorly protected from being caved in by traffic, especially at the ends, or with wooden boxes subject to rapid decay and destruction! Culverts and underdrains built of vitrified tile, concrete, or iron pipe are permanent, efficient, and economical in the long run.

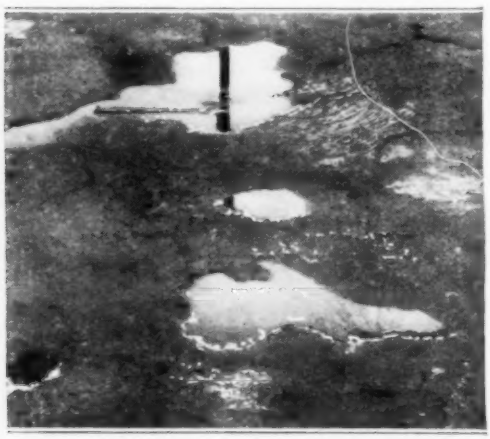
This Road has Just been "Graded." The Steep Side Slopes and the Heaps of Sod in the Middle Should have been Worked into the Shoulders of the Road



Concrete of Such "Soupy" Consistency as This has Lost More than Half Its Strength, by the Use of Too Much Water in the Mixing. The Standard Mix for Road Slabs Should Be as Dry as Possible but Still Workable

Ground water is not the only source of trouble on the earth road. Excessive crowning of the road surface promotes poor surfaces in equal degree. In many places, officials have, by their "working" the road, actually ruined what was a fairly good surface, and left instead a road with side slopes so steep that a flivver travels cornerwise like a trotting pug dog, or, if the road is wet, everybody crawls along the crest like a boy on the barn roof. And this is but one bad feature. By the steep pitches, the side thrust of machines traveling at good speeds make deep ruts lengthwise of the road—ideal retainers of water and promoters of mudholes. In times of rain, also, these steep slopes cause the road to wash in crosswise ruts, making the surface more like a corduroy road— impossible to travel in safety at speeds faster than a walk. The trouble has been that in giving instructions for dragging and grading the roads, everyone has said "start at the sides and work toward the center," forgetting all about the good rule that the road should have a maximum crown of one inch to the

foot. It matters little whether we begin at one place or the other, or whether the dirt is moved inward, outward, or any other way, so that the proper shape is



Wear on Concrete Road Caused by Poor Mixing and the Use of Too Much Water

obtained—a well-kept, slightly crowned road, comfortable and safe to travel and easy to maintain.

For most of our road soils, the use of a light grader once or twice a year and the systematic use of a light, one-horse drag to smooth and compact the road after every rain, will do more toward promoting good earth roads than any other method. Many heavy graders, levelers, and other forms of road machinery, so often operated by inexperienced men, actually do harm to the roads, in addition to wasting money in their operation. Often we find once nicely shaped earth roads, which needed just a little trimming by a light grader or the intelligent use of the drag, left by these men with steep side slopes and a pile of sod in the center of the road, dividing the traffic into two lines, wearing the road into ruts, and causing many a traveler to say uncomplimentary things about the road commissioner. Of course, during continued rains earth roads will be more or less impassable, but when well drained, they dry out quickly.

The earth road is the foundation upon which all other surfaces are placed, and upon which we should depend for the load-carrying capacity. When dry, it will support any load put upon it. When wet, its bearing capacity is small. Hard roads laid over it are but wearing surfaces, keeping the surface water from penetrating the earth foundation and providing a smooth track over which vehicles may be moved with little effort. The load-carrying capacity of these roads, like the earth roads, is determined by the condition of the supporting soil at its worst state. Why not increase the load capacity by strengthening the foundation—the only logical way—that is, by keeping the subgrade dry? Money spent in this way is an investment yielding large returns over an indefinite period of time.

Efficient subdrainage, therefore, is one of the most important items to consider in the design of hard roads. Although some water is necessary in gravel or stone roads, in order to keep the binding material from being carried or blown away, the amount in the earth below should be kept far below the saturation point. In the South, open ditches may possibly serve this purpose, but in northern climates, where the ground freezes to a depth of from one to three feet, tile is necessary in soils that do not have good natural drainage. In the spring, when drainage is most needed, the walls of the ditches are frozen up, preventing the escape of any ground water to them. When thawing takes place, it does so both from the top and bottom of the frozen section. The water from the surface is disposed of by evaporation, or by natural run-off through the side ditches, but the water released by thawing below the surface has no outlet except by some porous stratum below the frozen portion, or by tile. If neither is present, as is most commonly the case, the moisture so released serves only to raise the level of the water in the soil, thus increasing the height of this water with every freeze and thaw until the whole roadbed becomes saturated, the first heavy load breaks through the "crust," and we say "the bottom has dropped out of the road."

Nor is this characteristic of the earth or stone or gravel roads alone. On the

A Case of Lack of Drainage, Caused by a Mistake in Surveying: By Placing a Culvert One Foot Too Low, and Grading the Road to It, the Use of a Natural Outlet for the Water was Lost. To Eliminate This, It will Only Be Necessary to Deepen the Ditch Two Feet a Little Farther Down the Road

40-mile road between Cleveland and Akron, Ohio, over which so much heavy trucking of war materials was done, several short sections of pavement, aggregating about 1,000 feet, were destroyed a short time ago under the abnormal military and commercial motor-truck traffic. The broken sections were on a three-year-old brick pavement, wherein 4-in. paving brick were placed on a 6-in. concrete foundation, the joints between the brick being filled with cement grout, or mortar. In all fairness to the materials used, it must be said that the workmanship was not first-class and that the specifications were at fault in not providing a definite system of drainage for the road. When traffic first increased, the pavement slab showed signs of failure. Before long, those spots were but a mixed-up mass of individual brick, mud, and concrete—no piece of which was more than two feet in diameter—through which the trucks made their way as best they could. Here was an excellent example of water as a destroyer of roads. The foundation of the road was a fine undrained clay, which had become saturated with water, making it a nearly fluid mass incapable of supporting anything not of floatable nature. Judicious use of tile here, costing but little, would have saved an expensive paving slab costing several thousand dollars. It is interesting to note, also, that on other sections of the same road, carrying the same traffic, where the brick surface was laid upon a stone or gravel foundation without the aid of concrete—a much less expensive form of construction—the pavement withstood the traffic perfectly, the essential difference between the two being a well-drained subgrade.

Water as a destructive agent, however, is not confined to the foundations of roads, but is just as dangerous in hard-road slabs. Without it, they could not be built, but an excess of it is very injurious, especially in concrete roads or roads in which concrete is a component. Until recently, many road builders thought that concrete, mixed to almost any consistency, would be usable in construction work and give the same strength, hence we have seen many roads laid with concrete of a consistency better described as "soup." From a great number of experiments, made in the Structural Materials Research Laboratory, at Lewis Institute, Chicago, however, it has been established conclusively that the amount of water necessary to obtain maximum strength would make a somewhat dry concrete—too dry for ordinary use—and that to obtain the greatest strength, the least amount of water that will produce a workable mix should be used. To arrive at this conclusion, thousands of concrete cylinders were made, varying one thing, then another, to ascertain the proportions

The Use of Tile or Other Permanent Means of Drainage would Eliminate Road Conditions Such as This

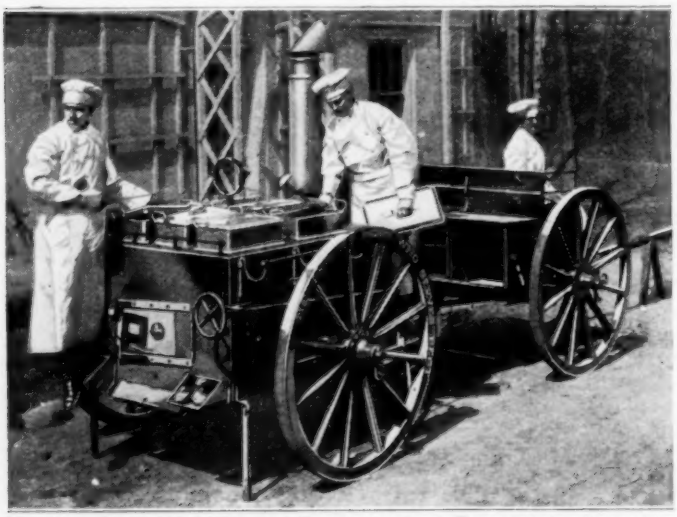
of cement and water which should be used in different mixes to obtain the strongest concrete. From these, the "normal consistency" was obtained which would enable the resulting concrete to withstand the greatest compressive test. Any larger proportion of water than that which produced the "normal consistency" would decrease the strength of the concrete rapidly. An excess of but 13 per cent of water decreased the strength of the concrete 20 per cent, this being equivalent to a reduction in strength which would have been caused by omitting 33 per cent of the cement. This shows emphatically the importance of controlling the amount of water in concrete, and gives the reason why roads made of "soupy" concrete now show so much wear and lack of strength.

It will be seen, therefore, what damage such an apparently harmless thing as water can do. It may make some roads impassable, undermine the strength of others, and destroy much of the strength of the rigid pavements in the making. Hence the logical remedy should reach the root of the evil—get the water out of the road. Money spent in this way is never lost. It is always working, helping to make our roads permanent for generations to come, and will be earning dividends long after all of us are gone.

¶The War Department's 15,000,000 excess hand grenades are to be remodeled as penny and dime-savings banks, and will be distributed to schoolboys and girls who can show one or more War Savings Stamps earned during the coming summer.

ARMY FIELD KITCHEN SERVES MEALS TO BOY "HIKERS"

Members of boy "hiking" clubs in the vicinity of Toronto, Canada, are experiencing a new joy in the use of a regulation army field kitchen, which is loaned to them, on application, by the local Rotary Club. The kitchen consists of a large steel tank on wheels, hauled as an auto trailer. A coal fire boils water in the tank, the constituent parts of a dinner being contained in six tin kettles immersed in the water. It cooks a three-course meal for 150 persons or prepares 900 cups of coffee at one time.



This Auto-Trailer Field Kitchen, Regulation Army Type, is being Loaned by the Toronto, Canada, Rotary Club to Any Boys' Organizations That Wants It. It Cooks 150 Meals, or 900 Cups of Coffee, at One Time

ANCIENT HALL REMODELED IS PRINCETON'S WAR MEMORIAL

Nassau Hall at Princeton University, built in 1756, is to be remodeled as part of the school's plan for a fitting war memorial in honor of the 132 men who left their studies to give their lives in response to their country's call. The entrance hall and a number of small rooms are to be torn out to make space for a new Memorial Hall, adjoining the Hall of the Continental Congress. Princeton heroes of all wars will be registered on tablets preserved in this room, which is to be paneled in oak or Indiana limestone. For each of the immortal 132, it is the intention to endow a scholarship, as a further means to perpetuate their memory.

FEDERAL LOAN BANKS PLANNED TO HELP HOME BUILDERS

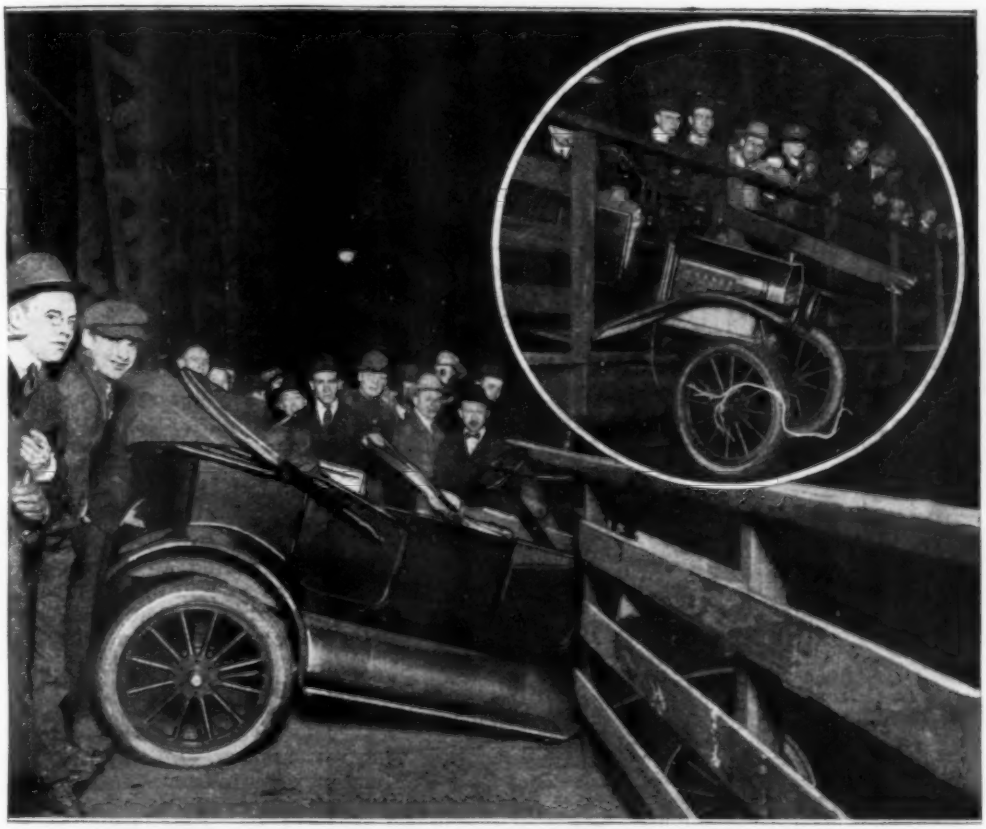
To encourage the building of homes, a Federal system of home-loan banks is proposed by the Department of Labor, and already has found support in congress. The success of the Federal farm-loan system, established three years ago, inspired the new plan. Its operation does not contemplate the direct loan of government funds to home builders, but the organization of a series of home-loan banks, one for each of probably 11 districts, to act as clearing houses for local building and loan associations. The banks would issue bonds for up to 80 per cent of the mortgages deposited with them, the interest rate being not more, and probably less, than five per cent. It is reported that building and loan associations favor the plan.

BRITAIN'S PREMIER MODELED IN RUBBER FOR CHILDREN

Lloyd George, Great Britain's dynamic premier, has been fashioned in rubber, for the amusement of the children and grown-ups of the island. Rubber is an appropriate material for the little figure—the harder he falls the higher he bounces.

BY COURTESY OF THE SKETCH

¶Air risks are now being underwritten by a well-known accident insurance company. The policies cover injury to pilots and passengers, public liability, and property damage, and the premium rates at present are four times those of automobile insurance.



Where a Heavier Car would have Made a 50-Foot Plunge into the River, This Light Auto Stuck in the Bridge Rail; but Before It Stopped, It had Hurled a Pedestrian to His Death. In the Circle the Car is Seen Overhanging the Water, in Which Position It Remained Until a Wrecking Crane Hauled It Out

AUTO SMASHES BRIDGE RAIL AND DROWNS PEDESTRIAN

One of those strange fortuities that determine the fate of men as surely as the least of animate creatures, snuffed out the life of a Chicago pedestrian a short time ago by hurling him from the security of the Rush Street bridge into the river, 50 feet below. A light auto swerved, its driver said, by contact with a heavier machine; smashed through the bridge rail, threw the man on the sidewalk to his death, and then stopped, its forward portion suspended in mid-air above the water.

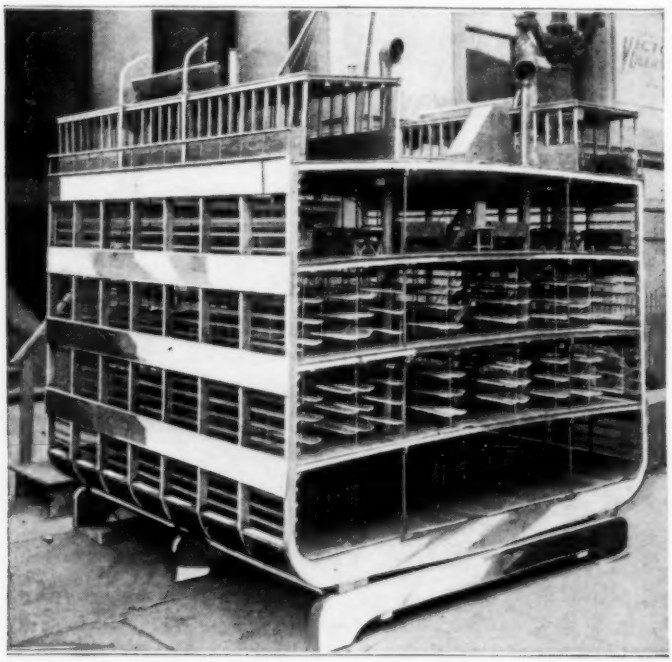
PANAMA LOAN SUBSCRIPTIONS CARRIED IN SUBMARINE

The Canal Zone promptly and handsomely oversubscribed its quota of the Victory Liberty loan; but on the last day of the drive the committee decided to give the total one last boost. So they arranged with the naval authorities that a submarine should make the trip from the Atlantic to the Pacific end of the canal, carrying subscriptions addressed to the loan committee in Balboa. Nearly two thousand applications, amounting to $360,350, were secured under this stimulus, and were carried on the eight-hour trip. Each subscription was mailed in a specially printed envelope which will eventually be returned to the subscriber as a keepsake.

Victory Loan Subscriptions Received in the Panama Canal Zone on the Final Day of the Drive were Sealed in These Envelopes and Carried to the Committee in a Submarine

CROSS SECTION OF TRANSPORT SHOWS TROOP BERTHS

To increase the efficiency of available shipping tonnage during the war, every article destined for France was "knocked down" and packed in the smallest compass possible. Bones were even removed from fresh meat. While the latter method is "impracticable" in hastening the homecoming of the American troops, every man who returns is willing to testify that no space goes to waste on an American troopship. The large-model cross section of the giant "Leviathan" shows how this and other luxurious passenger steamers were remodeled to furnish a maximum of space for bunks, mess tables, recreation spaces, and other military needs.



This Model Cross Section of the Huge Steamship "Leviathan" Shows How the Luxurious Passenger Steamer Became a Crowded Troopship. Every Available Inch is Devoted to Bunks, Mess Tables, and Other Military Purposes

FIRE-RESISTING BRICK MADE FROM SAWDUST

The making of fire-resisting brick from sawdust is an industry recently developed in the Pacific Northwest. Although practically any kind of vegetable matter can be used in the process, sawdust is chosen because of its cheapness and abundance as a waste product from the sawmills.

The new sawdust brick, manufactured under a secret process, may be called an achievement of chemistry, since the binder which gives it its strength and noninflammable qualities is a chemical compound, and the mechanical phase of its production involves nothing new.

The pulp, formed of the sawdust and binder, is shaped as desired and subjected to pressure, varying in intensity with the product being manufactured. Without baking or burning, it is allowed to set for eight hours. This completes the operation, unless it is desired to put a polish on the product, as in the case of fine tiling or fancy brick.

The product has been subjected to exhaustive tests and has proved adaptable and satisfactory for the making of brick, both building and paving; hollow tile; roofing and floor tile; culverts, conduits, refrigerators, and other molded forms, taking the place of clay products. A sawdust brick, produced and pressed without the aid of machinery, was subjected to a pressure of 77,820 lb., or approximately 2,500 lb. per square inch, before showing signs of checking or giving way. The test was remarkable, according to chemical engineers, considering the fact that the sawdust brick weighs about one-third as much as the ordinary brick.

In another test, the flame of an acetylene torch was applied to a brick for two minutes, but only charred the surface slightly. Being an almost absolute nonconductor of heat, the portion of the brick not touched by the flame was cool during the operation. As a further test of the brick's durability, it was soaked in water for 66 hours, then placed in a refrigerator and frozen for a period of 120 hours. Next it was placed in a baker's oven, as hot as it could be fired. It came out of these rigorous tests without showing any evidence of checking. A vitrified brick, tested at the same time, went to pieces after 10 minutes in the oven.

The sawdust material stood up as well under an electrical test as it did in that of temperature. A 10,000-volt current was applied to it, while dry, and one of 110 volts when wet, before it gave way.

Expansion and contraction of the new material are so slight as to be practically negligible. If desired, it can be applied and rolled as a single slab. For floors it is noiseless, resilient, and unaffected by water. The same advantages recommend it for paving.

Proposes Electric Dirigible to Carry Mail

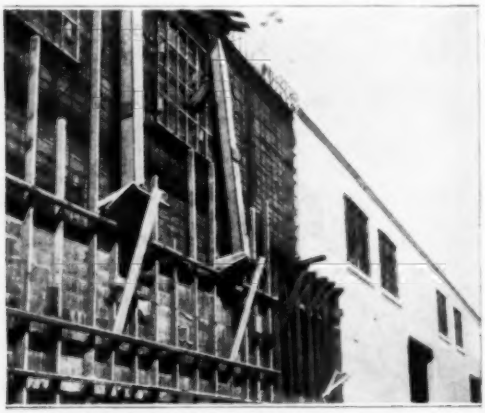
AN electric-trolley line winding across the country, with huge gas-bag cars flying in mid-air above it, is the peculiar feature of a Buffalo, N. Y., inventor's proposal for the transportation of mails. The dirigible's otherwise conventional form is improved by the addition of a hot-air duct between the car and the gas bag above. The electrically heated air from the car thus serves to regulate the buoyancy of the bag. Reasonable variation in altitude is allowed by feeding the double trolley cable from a winding drum. The trolley conductor itself is a double rail carried on A-shaped supports.

It is obvious that exceedingly firm anchoring would be required for this structure, or the insistent pull of the big bag in a high wind might conceivably trail great lengths of it across the fields, with terrifying results. But the fact most trying to those who aspire to apply electric drive to aerial uses, is that an electric motor of the low figure of 100 hp. would weigh scarcely less than 3,800 lb. A gasoline motor of equal power might weigh no more than 200 to 250 lb. This leaves so tremendous a margin for fuel cargo that any apparent advantage in supplying power from the outside is effectually dissipated. The designer of the system described suggests, as an alternative form, a smaller gas bag equipped with wings — a queer vehicle, half dirigible and half plane.

Trolley-Dirigible System, Electric-Motor Driven, Proposed for the Carrying of Mails, Particularly over Sparsely Settled Territory: The Pipe from Car to Gas Bag Carries Electrically Heated Air for Regulating the Buoyancy. The Trolley Cable is Wound on a Drum, Allowing Adjustment of Altitude

POURS CONCRETE INTO WALLS THROUGH SPOUTS

Before pouring any concrete for the walls of a San Francisco pier shed, the contractor completed the inside forms



Special Spouts are Seen on the Outside of the Structure, through Which the Concrete was Poured from the Roof

from floor to roof. Building the outside forms one-fourth of the distance up, he poured the concrete from the roof through special spouts. When it hardened he built another section and used the same spouts by cutting them off to the right length. The same was done on the third section, and the last section was poured directly from the roof without the use of spouts.

AMERICANS GONE TO FRANCE TO TEACH HOME COOKING

Four Americans, expert in the art of canning and drying, have gone to France to teach that nation how to "put up" fruits, vegetables, and meats at home. This is new work to the French, who now rely upon factories for their canned goods. The Americans, sent by coöperation of official agencies in both countries, will confine their efforts to instructing the teachers of French agricultural schools, who will pass the knowledge on to the people. Motion pictures as well as canning paraphernalia are included in their equipment.

AERIAL MAIL CARRIERS PROUD OF FIRST YEAR'S RECORD

The Aerial Mail Service is proud of the record made during its first year of operation. In contrast to the gloomy predictions made at its inauguration, the service has been a complete success. Commercial flying has proved far different from the military game. The six planes with which the service started have not fallen to pieces as was prophesied, but are still in use and still driven by their original engines. Millions of letters have been carried, and in all varieties of weather, the records showing that a schedule trip was made on March 29 last, in the face of an 80-mile gale.

AIR MAIL RECORD.
RIPS SCHEDULED 1263-SUCCESSFULLY FLOWN 1136-PERFORMANCE 90 PER CENT.
LES POSSIBLE 138310 - MILES FLOWN 128255 - PERFORMANCE 92.73 PER CENT.

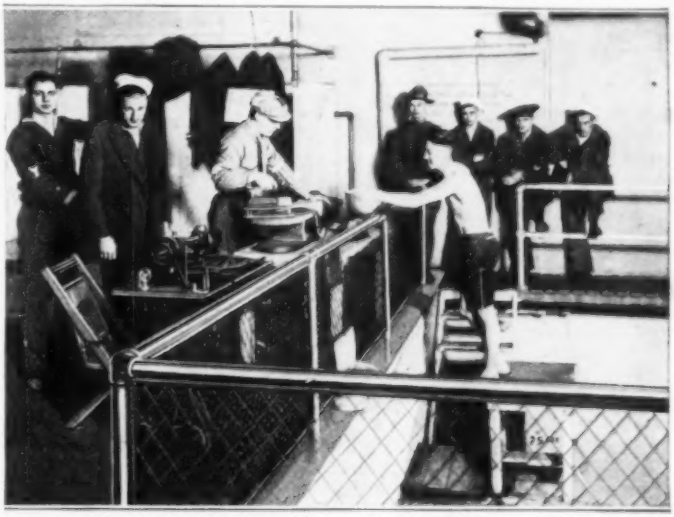
This Banner was Displayed at a First-Birthday Celebration of the Aerial Mail Service. Both Pilots and Postal Officials Are Proud of the Record Made during the First Year. The 128,255 Miles Traveled have been Flown in All Sorts of Weather and with Only 36 Forced Landings, All Due to Mechanical Trouble

CONCRETE STEAMER UNHARMED BY POUNDING ON SEA BEACH

There is one Norwegian sea captain who is thoroughly convinced of the seaworthiness of his concrete ship. Leaving Norway for a French port some time ago, in command of the first reinforced-concrete freighter to be commissioned in the Norwegian merchant marine, he encountered the stiffest kind of weather. He was pleased to find that his ship rode it out splendidly. But on the return trip, the air thickening and the waves running higher, his ship was forced off its course and hurled on the flat, sandy beach at the mouth of the Somme River. The pounding was so vicious that the captain expected his stone ship to shatter like a crockery pot. He was happily disappointed. After three hours of this punishment the sea calmed, receded, and left the vessel high and dry, but sound as a dollar. Astonished, the captain made his tour of inspection and was unable to find one crack or fracture. Waiting high tide, he floated his ship and made for the nearest port.

ENLISTED MEN SWIM WHILE SUITS ARE PRESSED

Those in charge of the Soldiers' and Sailors' Club in Seattle seem to understand the enlisted man's problems, and to realize in particular how anxious he is to appear his best while on leave. So, among other things, they have provided a tailor service which mends and presses his clothes while he takes a plunge in the club's swimming pool.



Between Swims in the Big Tank, the Sailor Instructs the Tailor Just How He Wants His Clothes Pressed. With This Service a Soldiers' and Sailors' Club of Seattle Comes to the Aid of the Enlisted Man, Modestly Claiming to Lead the World in This Venture

RAILWAY SPEEDERS QUENCH FIRES IN AMERICAN CAMP

In the American army's supply and concentration centers every precaution is taken against fire, which so readily consumes the wooden buildings and the accumulations of material. Fire buckets, extinguishers, and similar apparatus are always at hand. In one supply camp in France advantage is even taken of the narrow-gauge railway tracks which run to every corner of the reservation. Several motor-driven speeders have been fitted with chemical tanks, hose, and hand extinguishers, and thus equipped are given the right of way and rushed to the scene of conflagration.

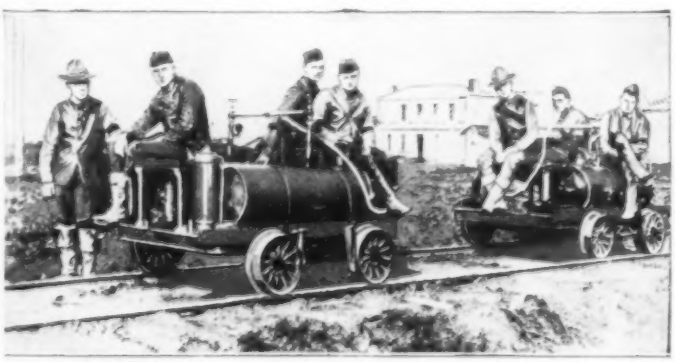
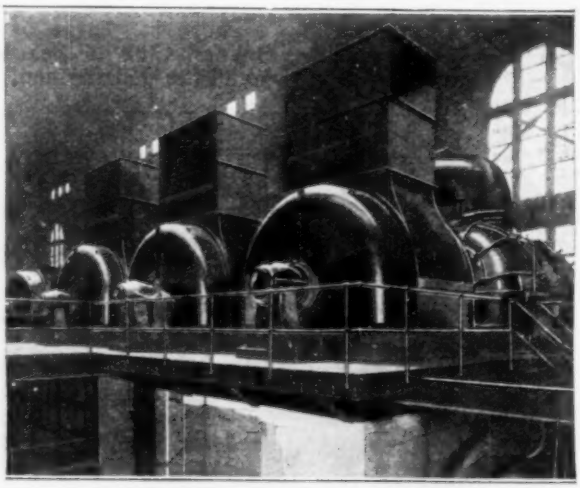


PHOTO BY SIGNAL CORPS, U. S. A.

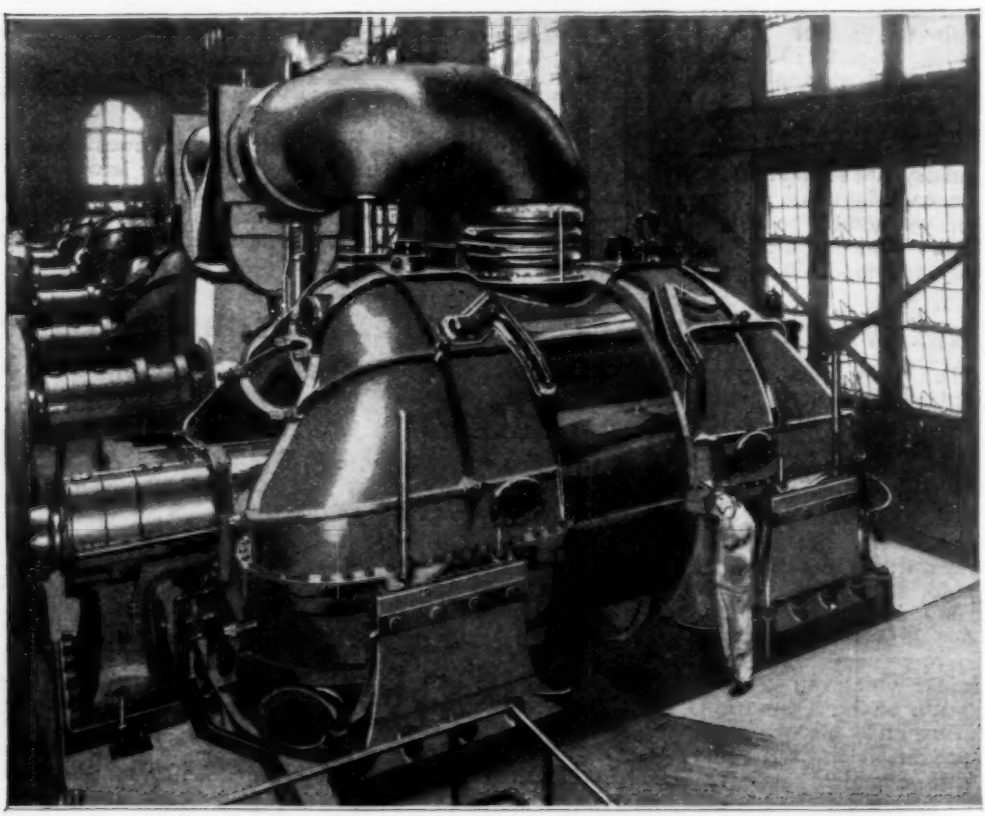
These Little Railway Speeders may be Rushed over the Narrow-Gauge Tracks to Any Endangered Part of a Great American Supply Center near Bordeaux, France

LARGEST STEAM TURBINE INSTALLED IN NEW YORK

The largest steam turbine ever built, developing 100,000 hp., has been installed in a street-railway power house at New York City. It is also the first three-cylinder cross-compound unit in America. Superheated steam at 205-lb. pressure enters the high-pressure element and exhausts into the two low-pressure elements in parallel, condensing at 29-in. vacuum. At full load, the unit takes 826,000 lb. of steam an hour. All the elements, which, in an emergency, can be used independently, run at 1,500 r.p.m., driving 25-cycle three-phase generators of 20,000 kw. each, at 11,000 volts. The three generators combined have a two-hour overload capacity of 70,000 kw. The installation occupies a floor space 52 by 50 ft., and introduced new problems in piping and foundations. The automatic-governing arrangements are unusually complete.



Generator End of the Big Turbine Unit, Showing the Similarity of the High and Low-Pressure Elements: The Stacks on the Generators Are Outlets for the Air Used in Dissipating the Extreme Heat Developed in These Enormous Engines



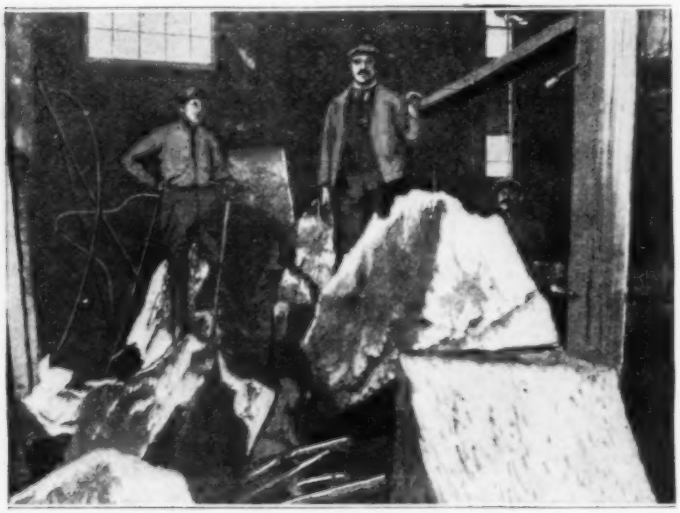
High-Pressure Cylinder of the 100,000-Horsepower Turbine: The Two Low-Pressure Elements Are Just beyond It, and Above is Seen the Massive Piping Which Connects Them. In the Distance Are Smaller Units Previously Installed

Vista down the Great New York Power House Where the New Turbine is Installed: It Appears at the Center of the Picture, Distinguished by the Air Stacks on Its Generators. Smaller Units Occupy the Foreground

At the Left Is Visible Part of One of the Old Flywheel Generators, Driven by Reciprocating Engines. Imposing as It Appears, This Unit Develops But 7,500 Horsepower. Compare It with the New Unit Just Beyond

BLASTING A MASSIVE VAULT ON A BUSY CITY STREET

Blasts of dynamite were used within a few feet of plate-glass windows and persons at work, without an accident and with entire success, in a recent operation for the removal of the vault in a vacated bank office on a busy city street. The vault, of brick set in Portland cement, was 14 by 12 ft. by 7½ ft. high; the walls 20 and the ceiling 30 in. thick; the latter being supported by 12-in. I-beams. Holes were bored in the walls, about 18 in. from the free ends, and light charges fired to take off small fragments at a time. The bore holes, as well as neighboring windows, were protected by boarding and canvas.



These Remaining Fragments of the Old Bank-Vault Wall were Readily Broken Up for Easy Handling by the Use of Small Charges of Dynamite

HIGHWAYS OF THE AIR MAPPED FOR U. S. AND CANADA

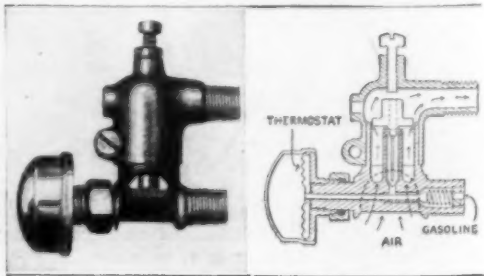
In an effort to safeguard and popularize air traffic, a recent Pan-American Aeronautical Congress suggested the recognition of official "airways" and "air routes." In the proposed regulations, a distinction is made in the use of terms, an "airway" being defined as a path or belt, 80 miles in width, stretching across the continent or along the coast. An "air route" will be but half as wide, and will be used to connect the more important "airways." Eight of the latter are proposed for the United States, five transcontinental and three coastal.

SCIENTIST DENIES MOTION OF ELECTRONS IN ATOM

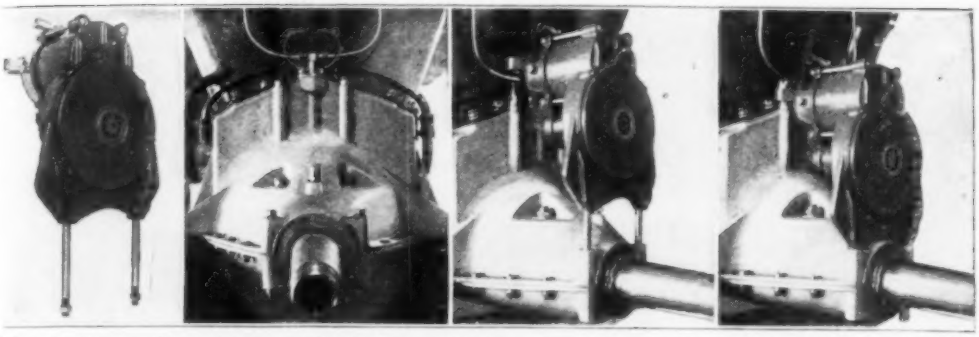
Theories about the electrons, which are the components of the chemical atom, are always difficult to verify by experiment. The atom itself is about one hundred-millionth of an inch in diameter; yet it dwarfs the electron as the dome of the national capitol dwarfs a pinhead. Despite the difficulties of work with such infinitesimal units, one scientist has completed a series of experiments which are expected to change the whole viewpoint of chemistry. In place of the old assumption that the chemical atom is a group of electrons in rapid orbital motion, he declares that the electrons are stationary, and are arranged in three dimensions, and in patterns of geometrical form. Proceeding directly from this assumption, he has tried to account for the nature of various substances by studying the arrangement of the electrons in the various atoms. He has even gone so far as to state that the atoms of inert gases, like helium and argon, are stable and exist in the form of a four-sided prism with one axis elongated.

WATER VAPOR FED TO MOTOR BY THERMOSTATIC VALVE

Automobile motors run best on damp days. To provide automatically the right degree of moisture at all times, and at the same time prevent the formation of carbon, a western inventor supplies a small



The Thermostatic Valve Regulates the Moisture Supply, as the Diagram Indicates



Electric Starters Like the One on the Left were Used on Many Navy Seaplanes during the War. The Next Picture Shows the Front End of a Liberty Engine with the Propeller Removed. The Third View Illustrates the Ease with Which the Starter is Fixed to the Crank Case, While, at the Extreme Right, It is Shown in Place

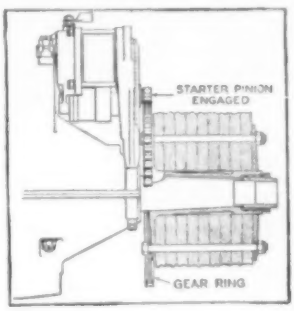
valvular device which taps into the water jacket of the cylinder or carburetor. An inclosed thermostatic diaphragm operates the water inlet according to the heat of the engine. The entire device is only 2½ in. high.

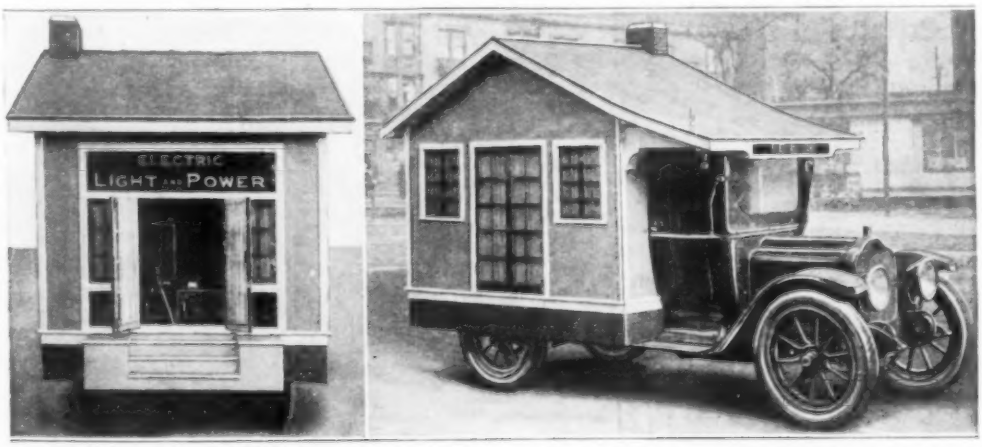
CARRY FARM-LIGHTING OUTFIT IN PORTABLE BUNGALOW

Electric-lighting systems for farmhouses not only are demonstrated at the farmer's door by an Indiana dealer, but a real house is taken along to show how the outfit works in practice. The idea of mounting an imitation dwelling on a motor-car chassis has been worked out with unusual attention to detail, presenting the half-size replica of a dainty bungalow. The operation of the lighting plant is thus seen by the prospective buyer as he would use it. The demonstration equipment, which cost about $3,000, attracts a great deal of attention.

ELECTRIC STARTER SUPPLIED FOR NAVAL SEAPLANES

With the removal of the veil of wartime secrecy it becomes possible to describe the electric starter with which many of our naval seaplanes are equipped. The mechanism is essentially a small electric motor, fitted with a double gear reduction and an automatic gear shift. As attached to the Liberty motor, it is bolted to the crank case, just behind the propeller, in space that would otherwise go to waste. The attachment is easily accomplished,





The Back Door Stands Invitingly Open, and from This View the Little Bungalow Reveals Only Its Demonstration Lighting Equipment, and Scarcely Looks Like a Motor Truck. On the Road, Its Appearance is Equally Attractive as may be Judged from the Right-Hand View

involving no alteration to the engine, but simply the manipulation of four bolts, and the mounting of a gear ring inside the propeller-hub flange. Then, to start the engine, a switch is depressed, the starting pinion emerges, meshes with the gear on the propeller, and cranks the engine at 40 to 50 r. p. m. As the engine starts up under its own power, the gears are automatically unmeshed, thus severing all connection between starter and crankshaft.

These starters were used on the navy's transatlantic machines, both the "Nancies" and the ill-fated "blimp."

INTERPHONE HELMETS USED IN AIR SERVICE

Equipped with the interphone helmets now used in the new wireless air service

An Interphone Helmet is Here Seen Disassembled to Show Its Inner and Outer Shells

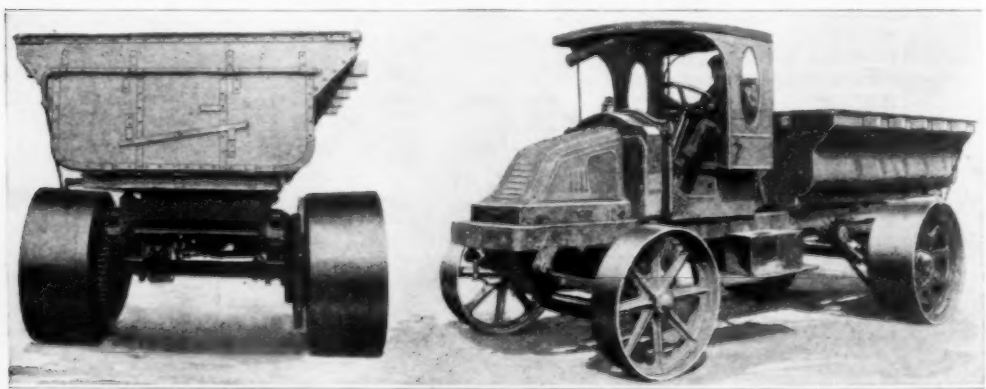
of the United States, all the airmen of a squadron can converse during a flight. The helmets are made of hair felt, like that used in piano hammers. The finished helmet consists of an inner and an outer hood, or "Russian" hat, the two separated by an air space. Through holes in the inner hood at the ears the phone receiver is inserted, and over this the outer hood is stretched. The leading-in wires are sealed in the outer hood, and all is tight as a drum. This air-tight feature combines with the air space to make the helmets impervious to cold.

WIND HELPS BUILDERS MAKE SAND ROADS

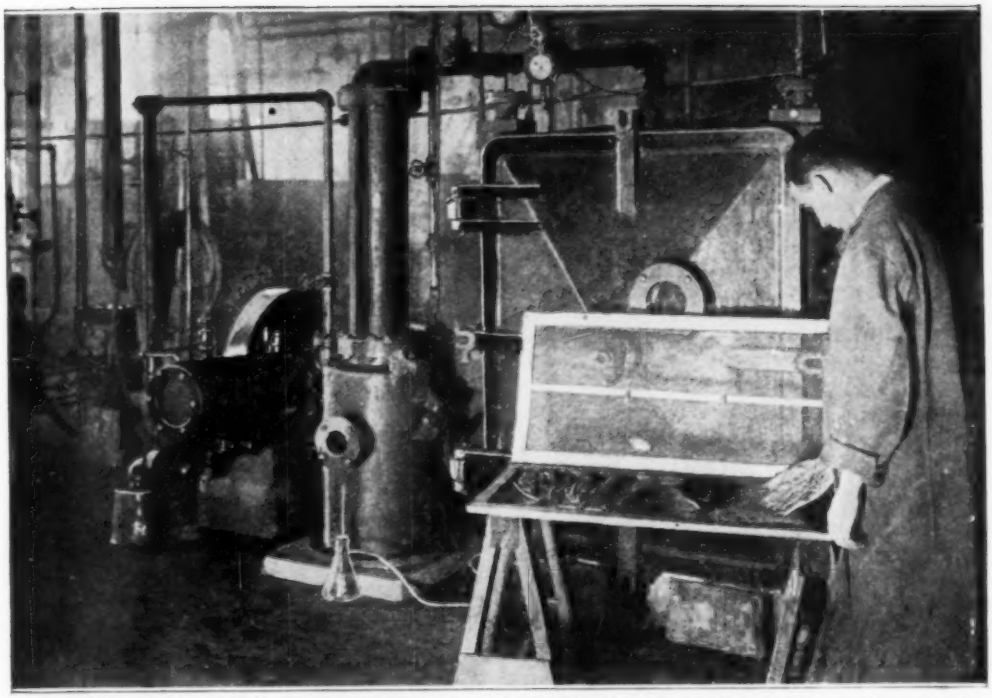
A new method of using the wind in sand-road construction has proved so successful, that, after making a nine-mile experimental stretch in New Mexico, road makers in that state have built 80 miles of similar highways. First of all, the grass and weeds are cleared from the right of way, and then a trench is made through the sand to the clay bottom. The loose sand is deposited in stacks 10 ft. from either side of the cut, and the rest of the work is left to the desert winds. During the spring and fall, the winds sweep away all the sand and widen the clay strip. Then the road is graded and the work finished.

BROAD STEEL-TIRED WHEELS ON CONSTRUCTION TRUCKS

To prevent damage to new roads by the heavy road-building trucks themselves, the vehicles are being equipped with flat steel tires of great width, riveted to cast-steel wheels. These wheels, interchangeable with regular equipment, are being produced in large quantities to meet the season's unusual activities in road construction. A five-ton truck, weighing loaded some 20,000 lb., leaves little impression on the softest of roads when equipped with such tires.



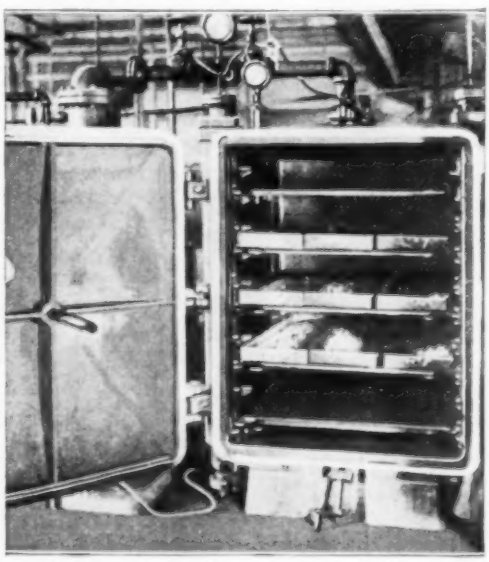
These Broad Steel Tires have been Designed to Facilitate the Season's Remarkable Road-Building Activity. Fitted with These Wheels, the Road-Building Trucks can Themselves Travel over the Soft New Roads, Enabling the Crews to Progress at a More Rapid Rate



General View of Columbia University's Dehydrating Plant: The Operator is Examining Specimens of Cod and Mackerel Which have Just been Dried between the Frames of Wire Netting, the Latter Keeping the Product Flat and in Shape for Economical Packing

VACUUM PROCESS OF DEHYDRATION PRESERVES MEATS AND OTHER FOOD

ALTHOUGH the preservation of food by drying is an old art, it was not until recently that the problem of food dehydration received any serious scientific study. As a result of many experiments, here and abroad, we are now in possession of enough facts to enable the development of the food-drying art into an industry of large proportions. There have appeared on the market preparations of dehydrated vegetables produced by some air-current system in which the cut vegetables are heated in a current of warm (dry or moist) air until the product is considered dry enough to keep. The results of this type of vegetable dehydration are quite well known. It must be noted, however, that the air-current system has two marked disadvantages. First, it is uneconomical, wasting about three-fourths of the fuel employed; and, second, it is not applicable to a variety of products, the most important of which is meat. We are familiar with South American jerked beef and air-dried fish. Those who have tasted either of these will realize the difference, in flavor and appearance, between them and the fresh product. The necessity for

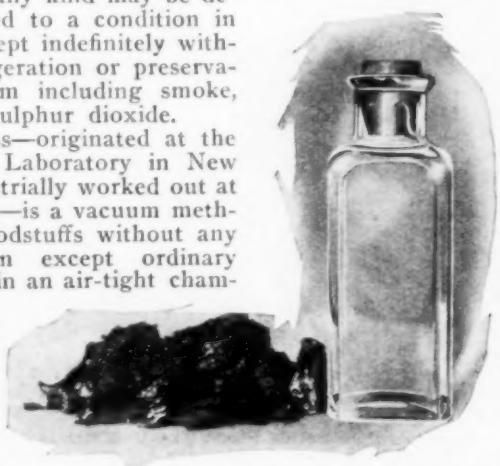


Vacuum-Drying Oven, Open, with Five of a Possible 12 Shelves in Place, and Three in Use: By Adjusting the Degree of Vacuum, Water may be Boiled at 100 Degrees

further development in dehydration of these products and the need for a more economical system was clear.

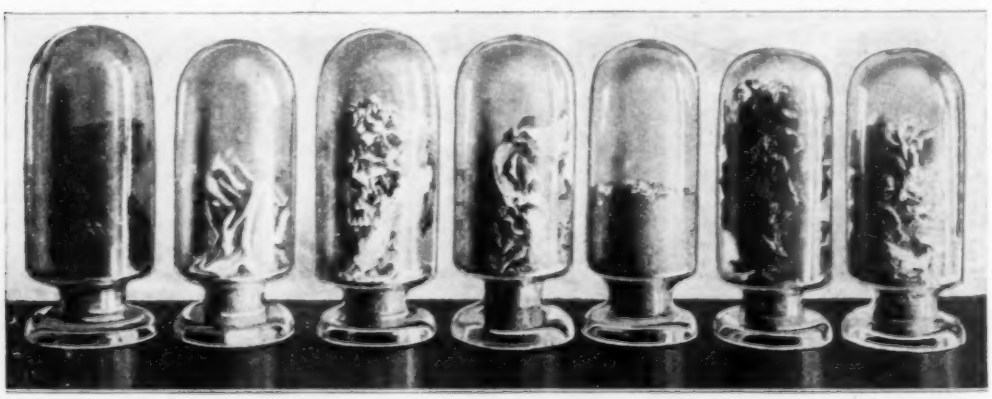
The task of evolving a process and developing a product suitable for use in the field was assigned to Drs. K. G. Falk and E. M. Frankel by the surgeon-general. In this they were successful, and there is now available for public use a method by which foodstuffs of any kind may be dehydrated and reduced to a condition in which they can be kept indefinitely without the use of refrigeration or preservatives, the latter term including smoke, salt, saltpeter, and sulphur dioxide.

Briefly, the process—originated at the Harriman Research Laboratory in New York City, and industrially worked out at Columbia University—is a vacuum method, in which the foodstuffs without any previous preparation except ordinary cleaning are heated in an air-tight chamber, from which the air and other gases or vapors are exhausted. Under these conditions the water in the food product, which ordinarily boils at 212° F., can, by proper adjustment of the vacuum, be made to boil at 100° F. Thus, the foodstuff is never overheated, and no coagulation of protein materials or other changes induced by high heat are brought about. As a result of the low temperatures employed, the volatile aromatic oils which give most vegetables and fruits their characteristic tastes, are retained. In contrast to the air-current system, drying in vacuum takes place from within the mass rather than from the surface, so that the outside of the pieces of food is not made tough and sometimes impermeable to water, as is the case with air-dried products. Again, many articles of food cannot be dehydrated in a current of air because of their tendency to darken unless they are treated beforehand to prevent discoloration. Thus, for instance, potatoes, both sweet and white, must be steamed first, while apples and other fruits must be impregnated with sulphur dioxide before drying. With the vacuum method it has been found unnecessary to resort to any of these preliminary treatments. Similarly, in the dehydration of meat and fat fish, it is possible, due to the absence of air, to preserve the fatty components without any tendency to rancidity.



The Bottle at the Right is Full of Water Extracted by the Vacuum Process from the Dried Beef at the Left

From the standpoint of cost, the new process leaves little to be desired. Despite the relatively high initial expense for the vacuum chambers, which must be built of fairly heavy metal, the operating cost is so much lower than those in any other dehydration system that the higher investment is soon repaid. The best practice in air-current systems involves a coal consumption of nearly four times that in the vacuum system. The power employed in maintaining the vacuum in the drying chambers

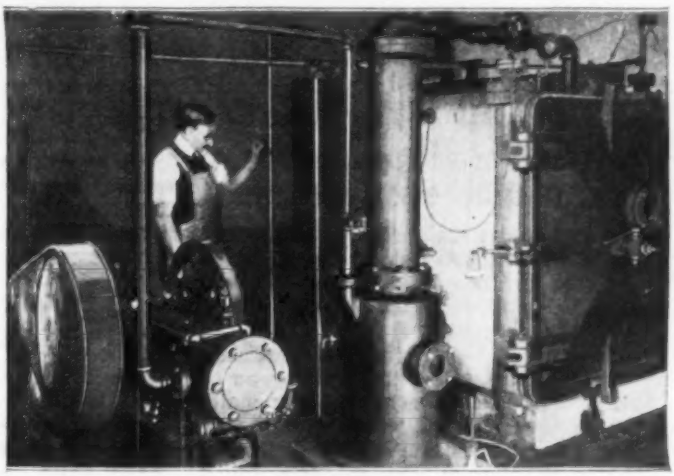


Bottles Containing Samples of Various Products Which have been Dehydrated by the Vacuum-Oven Process: In Order from Left to Right, the Specimens Are Tomatoes, Potatoes, Cabbage, Carrots, Ground Meat, Stew-Pieces of Beef, and Turnips

represents a very small item, since the exhaust steam is used as the source of heat for the drier. On the whole, the cost of drying meat is about equal to that of refrigeration, but since the expense ends with the drying, while each day of holding untreated food increases refrigeration expense, the economy of the method is apparent. A fair estimate of average cost is one-half to one cent per pound of fresh material.

The construction of the drier is relatively simple. In the main it is a chamber with cast-iron walls and doors, the joint between the doors and chamber being made air-tight with a rubber gasket. The interior of the drier is filled with a series of hollow shelves in which warm water, or low-pressure steam, circulates. The foodstuff to be dried is cut into suitable sizes, preferably less than an inch in thickness, and spread on metal trays which rest on the warmed shelves. After charging the drier, the chamber is closed, the vacuum applied, and the heating begun. Evaporation starts almost immediately, the length of time in which the process is completed, of course, depending on the thickness of the material and its nature. Thus, slices of meat, one-fourth inch thick, may be dried in less than two hours, while one-inch steaks require about 10 hours for complete drying.

The national economy that may be effected by food dehydration must not be overlooked. In the past, drying of food has been contingent on hot sun and favorable weather in general. Too warm or damp weather, flies and other insects, etc., all combine to make open-air drying a precarious method. Drying in artificial warm-air currents is expensive and irregular, and cannot be applied to all materials. Vacuum drying alone meets the needs of all foodstuffs and combines regularity and reliability with low-operating cost. Especially as applied to meat, vacuum drying is economical, since it permits the complete utilization of excess fat, bones, and other products at the packing house, where their maximum value can be realized; and so presents an opportunity for the reduction of food prices to the ultimate consumer.



The Machine at the Left Is the Vacuum Pump; in the Center Is the Condenser, and at the Right the Vacuum Oven. The Source of the Heat Used Is Exhaust Steam, and the Operator is Seen Regulating the Supply

ORCHESTRA "GUN" SHOOTS BY FOOT PRESSURE

The theater orchestra's busy trap drummer, required on occasion to produce all known sounds, may now interject his battle-scene or hold-up interpretations with single shots, or volleys, without moving a finger. One of the fraternity has devised a "gun" which shoots by foot pressure. Its wheel-shaped cylinder holds sixty .22-caliber and thirty .32-caliber cartridges, which may be fired singly, alternately, or the two sizes together, the latter making the report of a .41-caliber. A particularly realistic flavor is thus added to motion-picture accompaniments.

"Gun" for the Use of Orchestra Trap Drummers, Which Fires by Foot Pressure: The Chambers Hold Sixty .22-Caliber and Thirty .32-Caliber Cartridges

Hot, Appetizing Food was Rushed to the American Lumberjacks in French Forests Each Noon, on Railway Speeders Cut Down to Narrow Gauge. Leaving the Permanent Camp a Few Minutes before Mess Call, the Little "Gravy Trains" Reached the Most Advanced Cuttings Promptly

"GRAVY TRAINS" RUSHED FOOD TO AMERICAN LUMBERJACKS

The American lumberjacks who cut wood in French forests for the A. E. F. were an uncommonly husky bunch. Among other things, they liked lots of "chow," and they liked it hot. The cooks found it easy to satisfy them at breakfast and supper, but the midday meal was at first a harder task. The men were usually well into the timber by noon, and often in country far too rough for motor trucks. However, gasoline railway speeders solved the problem. Cut down to narrow gauge, they were run from the mill yards to the cuttings each noon, bearing hot, appetizing food. A few hungry cutters sometimes failed to hear the noisy approach of the "gravy train," but no lumberjack was ever known to miss the cook's final summons, for when that dignitary rose and belabored the battered old coffee can with a monkey wrench or other handy tool they always came in on the run.

FLOATING TOOL HOLDER REDUCES FRICTION

To reduce friction in reaming operations a floating tool holder has been designed in which the use of steel balls gives a rolling movement to the various parts. Four balls are set in grooves at right angles, the grooves being cut in the ends of the shank and socket, as well as in each side of a centerpiece. This allows room for both an axial adjustment and a swiveling movement. The weight of the shank is supported by a spring.

SMALL, LOW-PRICED BIPLANE TO APPEAR ON MARKET

Four army lieutenants, stationed at a Texas flying field, have designed and supervised the construction of a biplane that weighs only 450 lb. The two-cylinder motor generates 15 hp., and the wing span is but 15 ft., yet the little machine reaches a maximum speed of 75 miles an hour. Making only a few changes in the original machine, the lieutenants intend to use it as the model for a commercial plane which will sell for about $1,000. Small planes of this type will recommend themselves to many, as they can land in a country road, be carried intact on a motor truck, and kept in ordinary garages.

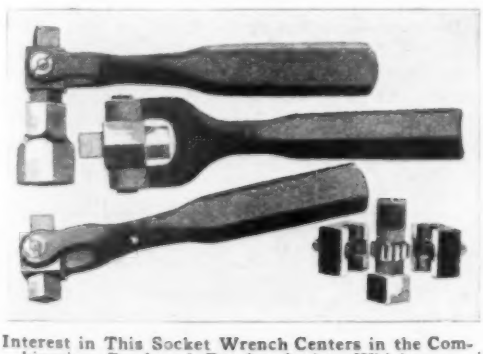
This Little 15-Foot Biplane was Designed by Four Army Airmen and Constructed under Their Supervision in the Shops of the Air Service. The Designers Intend to Construct Similar Planes for Popular Use

AMERICAN SHIPYARDS OPENED TO FOREIGN CONTRACTS

Large orders are expected from France, Italy, and Norway as a result of a recent presidential order permitting American yards to receive foreign contracts for steel ships, in so far as that can be done without interfering with the construction of our own merchant marine. In this connection the Shipping Board announces that only a few American yards are now in a position to accept such contracts, but that the situation will gradually be relieved. Despite their proximity to English shipyards, the three nations mentioned are so urgently in need of ships that an estimated total of 3,000,000 gross tons may be ordered in American yards under the provisions of this ruling.

RATCHETED SOCKET WRENCH FOR TIGHT CORNERS

A socket wrench of a type recently patented is often convenient for work in the cramped corners sometimes encountered about an automobile, tractor, or machine. In this case, a ratcheted head is mounted in a socket. The socket is pivoted between the arms of the shank, or handle, on two trunnions, which at the same time act as pawls for the ratcheted head. Two extension bars further increase the usefulness of the appliance.



Interest in This Socket Wrench Centers in the Combination Pawl-and-Ratchet Action, Which may be Understood from the Disassembled View

TRACTOR-DRAWN DRAG KEEPS ROADS IN GOOD SHAPE

Country roads around Maryville, Mo., —500 miles of them, at least—have been in good condition since the first of the year. Credit for that fact goes to the use of a heavy drag hauled by a farm tractor. A cutter blade in front levels the road, and a massive float in back breaks the clods and smooths the surface.

Use of a Tractor for Hauling Permits Road Dragging to be Done with a Heavy Special Drag, Having a Leveling Cutter in Front and a Massive Smoothing Float in the Rear

WIRELESS MUSIC ENTERTAINS MEN ON SHIPS AT SEA

Like all well-regulated ships, the transport "George Washington" has a phonograph. It also has wireless-telephone equipment of the latest design. On a recent occasion the phonograph horn and the telephone transmitter were brought face to face, and the music started. A hundred miles away, soldiers and sailors on the transport "President Grant" gathered eagerly around a loud-speaking receiver, from which issued the merry strains of song and fox trot, as the concert ship threw its melodious vibrations into space. Within the hundred-mile radius were several other radio-equipped ships, and when the concert was over the "George Washington's" operator was kept busy receiving encores.

¶After more than four years' service as an important military wireless station, during which no civilians were allowed to visit it, the Eiffel Tower in Paris, France, has been reopened to the public.

REPLANTING WAR-SWEPT FRENCH ORCHARDS

This French Family Garden is Getting Some New Apple Trees, Which the Government Nurseryman is Helping to Plant. The Garden has been So Carefully Restored That It would Show Little Sign of War but for the Ruined Building at the Back

With a Shell-Damaged Barn for a Background, the Government Expert and the Farmer are Planting a New Sapling to Take the Place of the Destroyed Tree Lying on the Ground

Forests and orchards in the devastated regions of northern France, mowed down by artillery fire or willfully destroyed by the retreating Huns, are being restored as rapidly as experts from the nurseries of the French government can accomplish the task of blasting out the dead trees and stumps. The entire expense of this work, as well as that of supplying and planting the new trees, is borne by the government, as it is considered of national importance that the farmers receive all possible encouragement to resume their industry.

PRIZE FOR NONSTOP FLIGHT FROM NEW YORK TO PARIS

In an effort to unite more closely the aeronautical interests of the United States and France, the land of his birth, a prominent New York hotel man has offered $25,000 to the first airman of any allied nation who crosses the Atlantic in a nonstop flight from Paris to New York, or from New York to Paris. Aside from the

stipulation that the trip be made within the next five years, all details and conditions will be left to the Aero Club of America, under whose auspices the donor hopes the flight will be made. The distance between the two cities is a good deal more than twice as long as any flight yet made by an airplane; but the donor is confident that the science of aviation will continue to develop during the next five years, and in consequence feels certain that his prize will be claimed.

LIFT DOORS OF UNUSUAL TYPE FOR FACTORY ENTRANCES

An Illinois tractor factory is now taking in its raw material through a doorway of unusual design, with a considerable gain in facility. The entrance, 24 ft. high, is closed by a huge lift door in two sections, the upper 19 and the lower 16 ft. wide. On the shoulders so formed, halfway up, rest the rails of an overhead crane, extending out above a switch track. The lift-door sections, together weighing over a ton, are so counterbalanced as to be operable by a hand chain at the side, the lower section lifting twice as fast as the upper. Doors of similar type, but without cranes and all of uniform 12-ft. width, have been installed to the number of 21 in a large railway shop in Illinois. These doors, some 16 and some 18 ft. high, are 2⅝ in. thick, and in the center of each is a small wicket door.

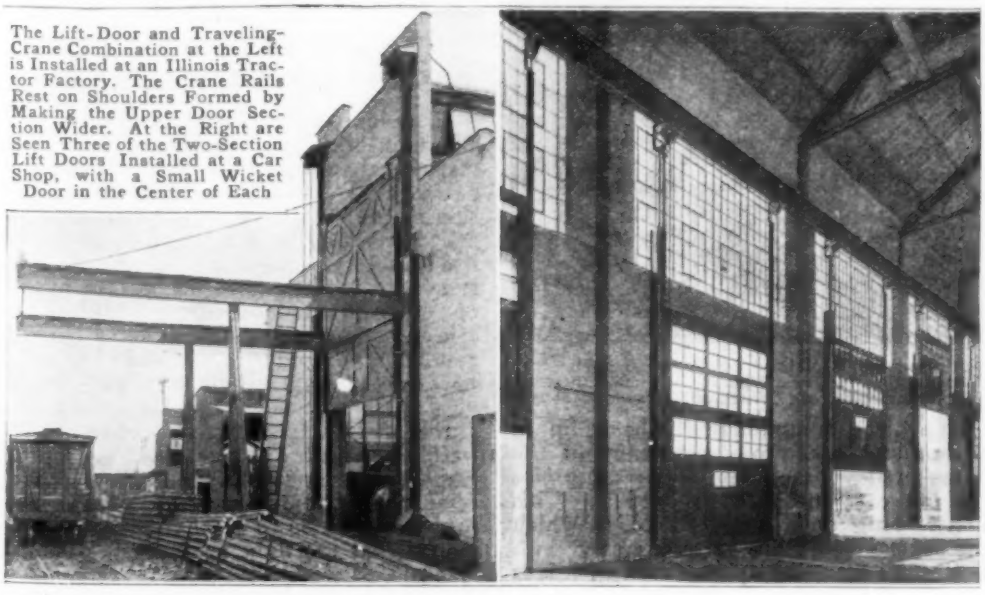
HANDCUFFED TO BICYCLES, TWO JACKIES CROSS CONTINENT

Handcuffed to their bicycles, two jackies are pedaling across the continent from Venice, Calif., to New York. When

Two Sailors from California, Tied to Their Bicycles by Handcuffs Which Cannot be Unlocked Until They Reach New York: Even the Keyholes are Sealed

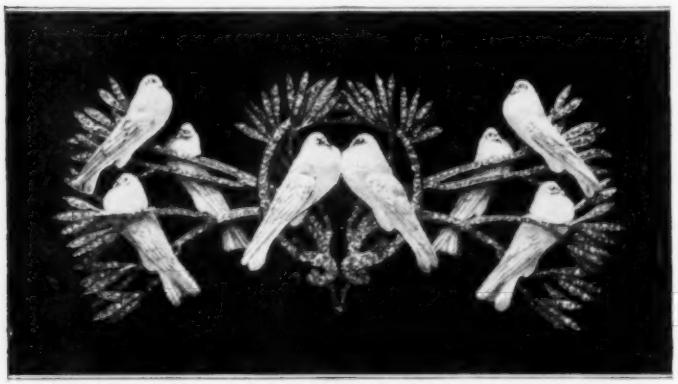
the handcuffs were locked the keys were mailed to New York and the keyholes sealed; these must be intact upon arrival at the end of the journey, which will require five months. The idea is to stimulate navy recruiting, and the boys will reenter the service. They are handcuffed to eliminate all suspicion of getting a "lift" while en route, from autoists or on trains. They expect to sleep with their wheels and to have their company at meals.

The Lift-Door and Traveling-Crane Combination at the Left is Installed at an Illinois Tractor Factory. The Crane Rails Rest on Shoulders Formed by Making the Upper Door Section Wider. At the Right are Seen Three of the Two-Section Lift Doors Installed at a Car Shop, with a Small Wicket Door in the Center of Each



JEWEL OF UNRIVALED BEAUTY ADORNS FIRST LADY OF LAND

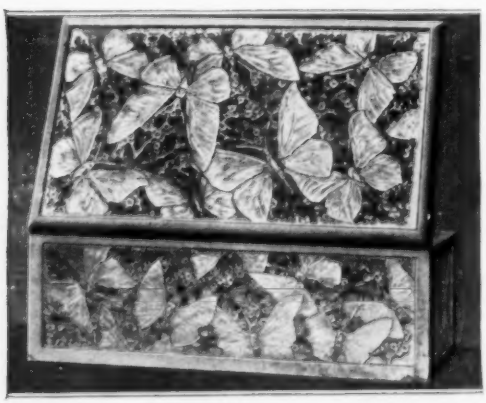
The elaborate corsage pin presented to Mrs. Wilson by the people of Paris is intended to symbolize the peaceful mission of the presidential party. Hence the most striking element of the design is the group of eight doves formed of white translucent enamel, against a backing of burnished gold which reflects the light in a suggestion of the undulating move-



PHOTOS BY COURTESY OF THE JEWELERS' CIRCULAR

This Corsage Pin, Presented to Mrs. Wilson by the People of Paris, Is the Work of a Celebrated French Master Craftsman. The Eight Doves are Made of Translucent Enamel on a Background of Burnished Gold

ments of actual life. The faultless little figures perch gracefully on interwoven, diamond-studded olive branches. The



This Casket is Acclaimed by Many as Even More Beautiful than the Jewel Which It is Intended to Hold. The Top and Sides are Formed of Engraved Glassware

whole piece is undoubtedly beautiful in design and execution; yet many of the artist's fellow craftsmen have more praise for the case intended to hold it. This box is built on a metal frame, in which are set panels of glassware engraved with butterflies on a dainty lacework of leaves and branches. These glass panels are worth particular attention, as the artist has devoted many years to this ancient craft of melting and molding glass into exquisite designs.

NEW ENGINE DRIVEN BY BOTH GASOLINE AND STEAM

By utilizing the heat energy which ordinarily goes to waste in the exhaust gases and water jacketing of a gasoline engine, a new British engine is reported to show a remarkable increase in power, accompanied by an actual decrease in fuel consumption. Fully 50 per cent of the thermal energy, ordinarily wasted, is recovered in this way, and used to produce steam. Piped to ports in the bottom of the cylinders, this steam is expanded against the backs of the pistons, causing an obvious increase in power, and even enabling the engine to handle large overloads for short periods. In a recent report on the performance of this new engine, an expert is quoted as saying that it is nearly 10 per cent more efficient than the famous Diesel engine, now considered the best of the several internal-combustion types.

ONE VARIETY OF SUGAR CANE IMMUNE TO TROPICAL DISEASE

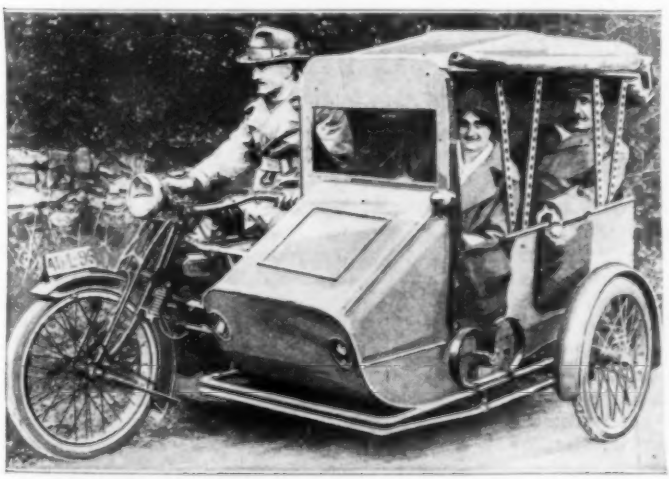
In response to a request from Porto Rican authorities, a scientist was recently dispatched to the island by the U. S. Department of Agriculture for an investigation of the "mottling" sugar-cane disease, called "mosaic," which threatened the entire industry. Selecting 90 varieties of cane, the investigator planted them, exposed them equally to the ravages of the disease, and several months later studied results. He found that, of the 90 varieties, only one, a Japanese plant called "kavangire," was unaffected and apparently immune. So Porto Rican planters are now watching with the keenest interest the further experiments with this variety. If it retains its immunity under test, and proves adaptable to local conditions, they realize that the fight against the dreaded "mosaic" is won.

FOREST BIOLOGICAL STATION MEMORIAL TO ROOSEVELT

As a memorial to Theodore Roosevelt, a forest biological station, devoted mainly to the study of wild-animal life, has been established at the New York State College of Forestry, Syracuse University. This station is believed to be the first of its kind to be established in the world. It is considered to be of great importance to foresters and zoölogists, though it is a project in which many simply interested in the conservation of wild life feel concerned. A better knowledge of all kinds of wild animals, birds, and fish is necessary, according to authorities, to enable lawmakers to pass suitable legislation for the protection and conservation of game. The idea of the biological station received the indorsement of the ex-president before his death. Funds furnished by the state of New York will support the station, though it is expected that donations from private sources also will be received.

MOTORCYCLE-SIDECAR TAXI CARRIES TWO PASSENGERS

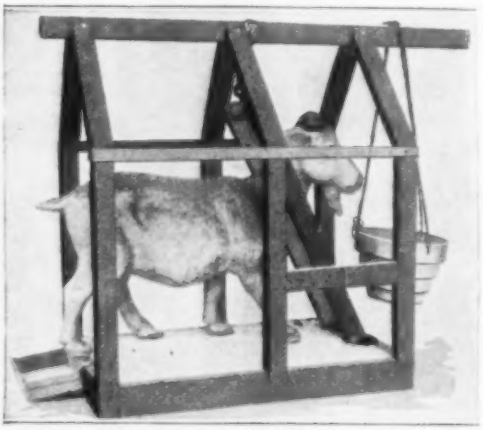
A curious type of two-passenger taxicab is being introduced in England, where its relatively low rates of fare promise to bring it considerable popularity. The cab itself is a motorcycle sidecar, with two separate seats, a windshield, top and curtains, and easy springs. The driver, of course, remains out in the open, at his post on the motorcycle.



Top, Windshield, Curtains, and Separate Seats Give This Motorcycle Taxicab Most of the Comforts of the More Familiar Type

MILK GOAT EASILY KEPT IN BACK-YARD STALL

One city dweller has found it possible to keep a milk goat on his property by constructing a small, movable stall in which the animal lives comfortably in any corner of the back yard or basement. From a light framework he suspends a yoke which incloses the animal's neck, and also a little basket manger.



Wood and Concrete Are the Materials Used in the Construction of This Little Stall, by Means of Which a Milk Goat may be Kept in an Odd Corner of Back Yard or Basement

GOVERNMENT SHIPPING BOARD OFFERS VESSELS FOR SALE

The centrifugal force that is rapidly scattering the cast-off machinery of war was evidenced in the sale, recently, of four—or, to be accurate, three and a half—steel vessels by the United States Shipping Board. The "Charles R. Van Hise," at Buffalo; the "Frontenac," with its forward portion at Erie, Pa., and its stern at Dalhousie, Ontario; the "Blue Hill," and the stern portion only of the "Manola," at Ogdensburg, N. Y., were all knocked down "as is" to selected bidders. The bids were sealed, conditions being of the usual form. The ships ranged in size from about 2,000 to over 5,000 approximate gross tons.

MEALS KEPT WARM IN TRANSIT IN INSULATED RACK

The pleasure of eating a meal in one's hotel room is usually mixed with disappointment on discovering, from the temperature of the food, that the waiter has stopped to snatch a few minutes' sleep on his way from the kitchen. But now he may sleep an hour, thanks to a movable table used in one hotel. In the kitchen the dishes are placed on the shelves of an asbestos-lined compartment under the table top. Rolling easily on its rubber-tired wheels, the table is pushed to the guest's room, temperature being maintained meanwhile by glowing charcoal bricks held in a drawer beneath.

Meals are Rolled from the Hotel Kitchen to the Guest Room in the Insulated Rack beneath This Little Table. A High Temperature is Maintained by Charcoal Bricks Contained in the Drawer Seen at the Bottom

SIDEREAL AND SOLAR TIME ON ONE POCKET CLOCK

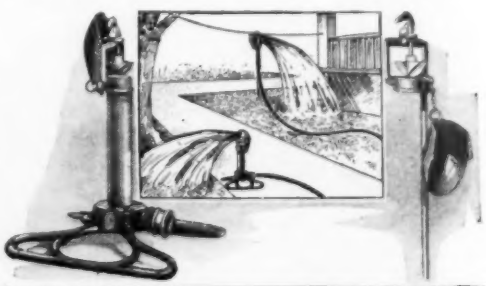
A clock with four dials, yet small enough to be carried in the pocket, and reading simultaneously in both mean solar and sidereal time, has been designed by a Danish astronomer and engineer. Two of the dials are for the two kinds of hours. The dial for minutes has two hands, one making 366 revolutions while the other makes 365. The seconds dial is for mean time only. Either set of hands may be adjusted to local time or that of any meridian desired. Seamen, astronomers, and geodetic surveyors will find the new timepiece particularly useful.

CEREBRAL CONGESTION SEEN AS CAUSE OF STAMMERING

Stammerers and their friends alike should be interested in the conclusions recently announced by a psychologist, at the close of a long series of experiments on both normal and affected individuals. He has come to believe that the fear of stammering, just like mental shock or fright, causes a rush of blood and consequent congestion of the brain areas, particularly of those governing the function of speech. He calls attention to persons struck dumb by intense fright, and to inexperienced public speakers who have completely forgotten their text in a moment of panic. Similarly, he says, when the stammerer attempts to speak, his very fear that he will stammer causes cerebral congestion, and a consequent blurring of verbal imagery. For example, knowing that a word contains a consonant or vowel which he pronounces with difficulty, the stammerer begins to fear that consonant or vowel, the speech areas of his brain become clogged, and he pronounces imperfectly or even forgets the sound he wishes to articulate.

SPRINKLER SPRAYS LAWN IN EVEN HALF CIRCLE

It is possible to spray a lawn thoroughly, and still retain the good will of neighbors and passers-by, with a new



The New Lawn Sprinkler is Shown in Two Forms. A Brass Deflector Plate, on Both Models, Distributes the Water Evenly over a Half Circle

No Man's Land Was Never More Desolate than These 20 Square Blocks in Mobile, Alabama. For Four Hours the Blaze Was Master of the Town

The Housing Problem Was a Difficult One for Mobile, Even before the Catastrophe. With the Destruction of 200 Homes It Becomes the City's One Interest

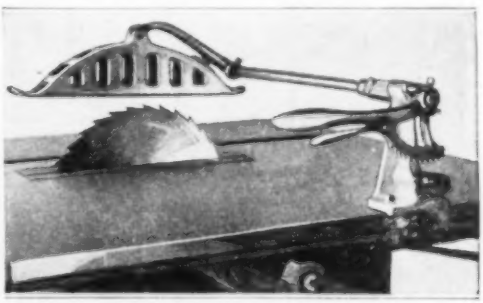
sprinkler that distributes the water evenly over a half circle. A removable brass deflector plate controls the shape of the spray by covering one side of the spinner, which turns freely on a steel ball against the end of a brass rod. One form is made with an iron base, another with a pointed ground rod. By means of a hook at the top, the sprinkler may be slid along a taut wire for spraying large lawns or gardens. With the spinner removed, it throws a solid stream, and may be handled like an ordinary hose nozzle.

HUNDREDS OF WOODEN HOUSES VANISH AS FLAMES ROAR

Fire originating at 3:30 p. m. in a backyard rubbish heap in Mobile, Ala., recently stole along a board fence, ignited a wooden dwelling, and before anyone realized the seriousness of the situation, had roared its way through the crowded neighborhood. Gathering speed among the tinderlike little pine cottages, it jumped street after street, until 20 square blocks had been swept clean. During the first hour the fire department labored almost unassisted, as the males of the families were away at their daily work; but as the dismayed city saw the smoke roll higher and higher, employes were released from shops and offices, until 20,000 men were fighting for their homes. Yet the blaze swept where it would until 7:30 in the evening, when the changing wind blew it back upon itself. Representatives of relief organizations at once picked their way through the smoldering district, and counted 200 brick chimneys as the sole remains of as many houses.

GUARD ABOVE CIRCULAR SAW SAVES WORKMAN'S FINGERS

If there is one thing more dangerous than dynamite, mill owners believe that it is a high-speed circular saw. It is improbable that the latter will ever be made completely harmless; but a step in the right direction is made by a new adjustable guard. Primarily a cap for the exposed section of the whirling blade, it is so hung from a movable arm that it may be raised or lowered to barely clear the lumber being cut. Or it may be dropped completely over the blade when the latter is running idle on a direct line shaft.



This Circular Saw Has a Guard, or Cap, Which May be Raised or Lowered

SCRAP IRON AND KINDLING WOOD MUTE EVIDENCES OF LOGGING TRAIN'S TRAGIC RUNAWAY

FAILING to realize the tremendous momentum which urged his 12 logging cars down a Washington mountain side, the engineer whistled too late for "brakes," as he approached the sharp curve at the foot of the grade. The "brakies" tugged at their wheels; but the little cars rolled toward destruction with increasing speed. Preferring injury to helpless death, the brakies jumped as the doomed train hit the curve, and was derailed. They found the engineer dead in his cab, and his fireman fatally hurt.

VALLEY OF 10,000 SMOKES BEING STUDIED AGAIN

Several expeditions have already penetrated the Valley of Ten Thousand Smokes on the Alaska Peninsula, just north of Kodiak Island. On their return, these parties have rendered reports that are almost unbelievable, although substantiated by many photographs. Here elemental nature has her workshop. From innumerable fissures and craters, large and small, rise jets and curtains of charring steam and odorous gases. Hillsides crumble and fall with a roar, as the volcanic forces disintegrate the rocky masses. And now the weird valley is being studied again, this time by a group of specialists, including a chemist, a petrographer, a zoölogist, and a motion-picture photographer. The report of the chemist is awaited with particular interest, as he is testing the fissures for helium, the non-inflammable gas which promises to revolutionize the science of ballooning.

PAINTED BACKGROUNDS PLACED BEHIND RAILROAD SIGNALS

Locomotive engineers on a western railroad complained that several semaphore block signals on their runs were difficult to see from a distance against the green forest background. Others were hard to distinguish against the blinding light from the morning or evening sun. To remedy these conditions the company is experimenting with square, painted backgrounds for the signal arms. A slot in the square permits the arm to be seen against the sun, while the white background removes the confusing dazzle.

TRACTOR FOR LAWN MOWER REPLACES ONE HORSE

A tiny two-wheel tractor designed for garden work has been found particularly suitable for hauling the gang mowers used on golf courses. It takes the place of one horse, and maintains about the same speed —2½ miles an hour. It is steered from the mower with a pair of handles, like a plow, and controlled with one lever. The engine is equipped with a hit-and-miss governor, and consumes about four gallons of gasoline a day. Lugs on the traction wheels prevent damage to the turf.

This Little Tractor Runs at 2½ Miles an Hour, and Replaces a Horse for Hauling a Gang Mower on Golf Courses. It is Steered with Plow-Style Handles and Controlled with a Single Lever

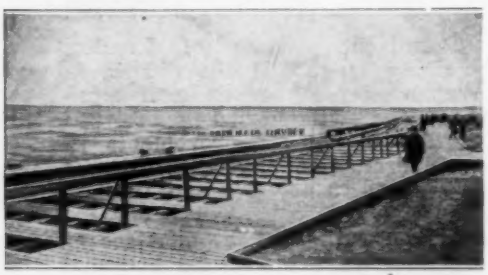
BRITISH PLAN TO TRANSFORM HISTORIC WESTMINSTER

Prominent citizens of London are planning to rebuild the district around Westminster Abbey as a memorial to those who distinguished themselves in the world war. The improvements include the construction of a great avenue, 120 ft. wide, and a new Lambeth bridge. The design for the bridge will be chosen from plans submitted by architects from all over the world. Splendid buildings are projected for the University of London, for a Shakespearean theater, and for arts and science exhibits. The new avenue will contain groups of statuary commemorating the heroic deeds of the British, Canadian, New Zealand, and Australian forces, as well as those of Britain's allies. It is intended to make this the finest and most impressive monumental avenue in the British empire.

Circulating Grocery Store Which Makes the Rounds of Its Customers on a Fixed Time Schedule: The Patrons Bring Baskets and Help Themselves, Sometimes Riding a Short Distance While Making Their Selection, and Paying the Driver, Who Stays at the Wheel, Just as They Leave

CUTTING OF BOARD WALK SAVES IT FROM DASHING WAVES

When the dashing of the breakers at Brighton Beach, N. J., had threatened to undermine the board walk and carry it away into the Atlantic, the local authorities adopted the plan of cutting open



This Broad Board Walk on a New Jersey Beach was Cut Open in Many Places to Lessen the Force of the Breakers

spaces in the walk at dangerous points. This allowed the waters to escape easily without doing serious damage.

¶Canada shares Denmark's interest in the discovery of rich coal deposits in Greenland.

STORE CALLS ON CUSTOMERS WITH LINE OF GROCERIES

There seems to be no end to the surprising things enterprising persons put into motor-truck bodies nowadays. A man in Dallas, Tex., has a whole grocery store mounted on rubber tires, and takes a complete stock of household supplies to the very doors of his customers. The traveling emporium is of the self-help variety; the proprietor-driver remains at the wheel of his craft, his patrons making their own selections and deliveries. A fixed time schedule is observed, and the customer whose purchases are not completed when time is up, gets a short ride to the next stop. The pecuniary arrangement is "pay as you leave."

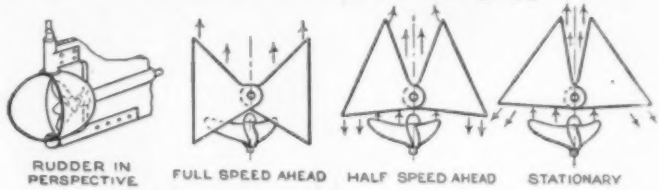
WARNING TO AIRMEN PROPOSED FOR TELEGRAPH POLES

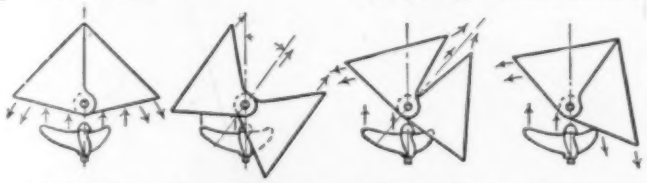
Airplanes have come to grief again and again, on approaching the ground, due to the relative invisibility of telephone and telegraph wires. Even at low altitudes the wires can sometimes be seen only with the greatest difficulty, because of fog, dusk, or a confusing background. So it

has been suggested that the top of each pole carry a large plate marked with a conspicuous warning signal, such as a combination of the Red Cross with the zigzag high-tension symbol. Such markings would make it easier for an airman to make his way across unfamliar country.

TURNS, STOPS, REVERSES SHIP WITH PECULIAR RUDDER

While American experiments with reversing boat rudders developed the type described in Popular Mechanics last October, an English device for the same purpose successfully met the tests of the British Admiralty and is now disclosed. Its form is two triangular sections of a hollow cylinder, normally inclosing the propeller, but so attached to the tiller that they turn together or separately. Bringing the rear edges nearly together stops the boat, and wholly closing them reverses it. Either in this position, or with sides parallel for full speed ahead, it steers like an ordinary rudder. Intermediate positions give a variety of movements, closely controlled. No reversing gear is needed.



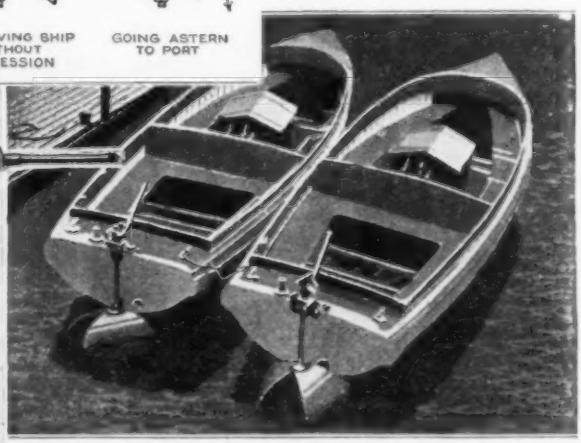


The Diagrams Illustrate the Relative Positions of the Cylindrical Blades for Executing Various Maneuvers, and the Arrows Indicate the Direction of the Water Currents in Each Position

BASKET MADE OF COW'S UDDER BY INDIANS OF CHILE

The Araucanian Indians of Chile make a handy basket of the cow's udder. The flesh is first carefully removed from the skin and a hoop inserted through slits around the top. The skin is then packed full of dry peas, molded to the desired shape, and left to dry. The peas absorb the moisture and swell, stretching the skin, which is emptied when sufficiently dry to retain its form. It is next packed with wood ashes, and after a few days is dry and hard. A string for a handle completes the basket, which is useful for carrying eggs.

The Sensitive Rudders are Sometimes Controlled with a Tiller, as Shown Here. At the Left, the Propeller would Force the Water against the Closed Plates, Pushing the Boat Backward. With the Tiller Depressed, as at the Right, the Curved Plates are Turned Parallel to the Propeller Stream, Permitting Forward Motion



Two of the British Navy's 20-Foot Motorboats are Shown Equipped with the New Rudders. Acting as Brakes, These Rudders Quickly Rob a Ship of Its Speed and should Consequently Prove Valuable in Preventing Collisions

BY COURTESY OF THE MOTOR SHIP AND MOTOR BOAT, LONDON

"STEVE BRODIE" AIRPLANE LANDINGS

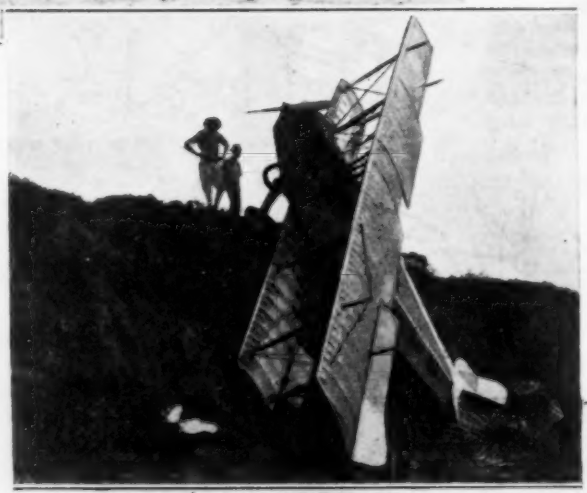
By JOHN EDWIN HOGG

THERE is a pigeonhole in the desk of every commanding officer at all the nation's big aviation fields labeled "Steve Brodie Landings. Reports to Washington." In the air-service vernacular a Steve Brodie landing is one of the same general type as was made by that gentleman when he attained world fame by jumping off the Brooklyn Bridge and splashing into the East River. Steve Brodie not only made the spectacular jump, but he "got away with it." So that is what is meant by a Steve Brodie landing by an airplane.

There is not an aviation field in the country that has not had a certain number of Steve Brodie landings. We have all read of a good many landings in the daily press reports that were not Steve Brodies. Such landings are usually dismissed with one or two lines, stating the airman's name under a headline that tells the whole tragic story. But Steve Brodie landings are different. They are usually spectacular in the extreme, while others have been weird, or even ridiculous.

The greatest number of Steve Brodie landings occurred in this country during the feverish days after the United States had entered the war, at which time both the army and navy were bending every possible effort to produce aerial fighting men from cadets who a few weeks before did not know a joystick from an aileron. In those dark days there were numerous Steve Brodie landings resulting from cadet fliers running into each other in mid-air. One machine might lose its tail,

This Machine Fell Out of Control, from a Height of 7,000 Feet; Casualties, None



The Student Who Made This Landing Isn't Very Proud of It. He Found That He Was Afraid to Land His Machine; So He Flew Around and Around Until His Gasoline Tank Ran Dry, When He Landed as Best He Could; Casualties, None

During a Cross-Country Flight, the Cadet at the Controls of This Biplane Decided to Stop for Tea at the Little Roadside Inn. He Stopped, but on the Roof, and Not on a Near-By Field as He Intended; Casualties, None

The Unusual Landing Pictured at the Center of the Opposite Page is Here Shown from Another Viewpoint. A Timid Novice Forgot How to Make a Good Landing, but He Succeeded in Making a Remarkable One. He should Have Great Respect for the Providence Which Watches over Beginners in All Professions

and the other a portion of one wing. Then there would likely be two Steve Brodie landings. Of course, a certain number of these accidents were traced to unavoidable causes, such as defects in the machines, motors stopping over country where safe landing was impossible, a v e r s e weather conditions, and other things. The best feature of such landings, however, was that with each one something was learned to advance man's conquest of gravity, until the number of Steve Brodie landings are far less numerous today than they

Landing This Pursuit Plane for the First Time, the Cadet Overran the Field and Stood on His Nose in the Hummocky Expanse Beyond; Casualties, None

w e r e a few months ago, in spite of the steady growth in aeronautical activities.

¶ For the blind people of Great Britain a geographic and industrial atlas of the Isles has been prepared. More than 20 maps are included in the 222 pages of the volume, each map embossed for study with the finger tips. Every detail on the map bears an identification number the interpretation of which is given by a key on the page facing the map.

The Engine in This Biplane Stopped at 2,000 Feet, over Wooded, Hilly Country. A Tiny Pasture Was the Only Possible Landing Field. By Squeezing the Last Bit of Glide Out of His Machine, the Cadet Reached the Pasture—to Discover a Herd of Cows There before Him. Powerless to Rise Again, He Landed on the Brush-Covered Hillside; Casualties, None

AIRPLANE PARACHUTE CARRIED IN POCKET UNDER FUSELAGE

In its search for a parachute arrangement which will satisfy every requirement of safety and convenience, the air-service

When the Airman Makes His Leap for Safety the Rope from His Body Harness Jerks the Parachute from Its Canvas Pocket beneath the Fuselage

authorities have lately experimented with a parachute contained in a canvas pocket beneath the fuselage. An amusing proof of its reliability was furnished at an aviation camp several weeks ago, when a young war veteran put the apparatus to the test. A crowd of civilian spectators saw him leap from the plane at an altitude of 3,300 ft. Everything seemed to work with precision, yet when they saw him wave his arms about while still 2,000 ft. overhead, they gasped. Surely something must be wrong. In the crowd were soldiers, however, who chuckled to see their cool-headed comrade signaling by arm movements to friends on the ground.

CANADIAN CHEMISTS FORM NATIONAL INSTITUTE

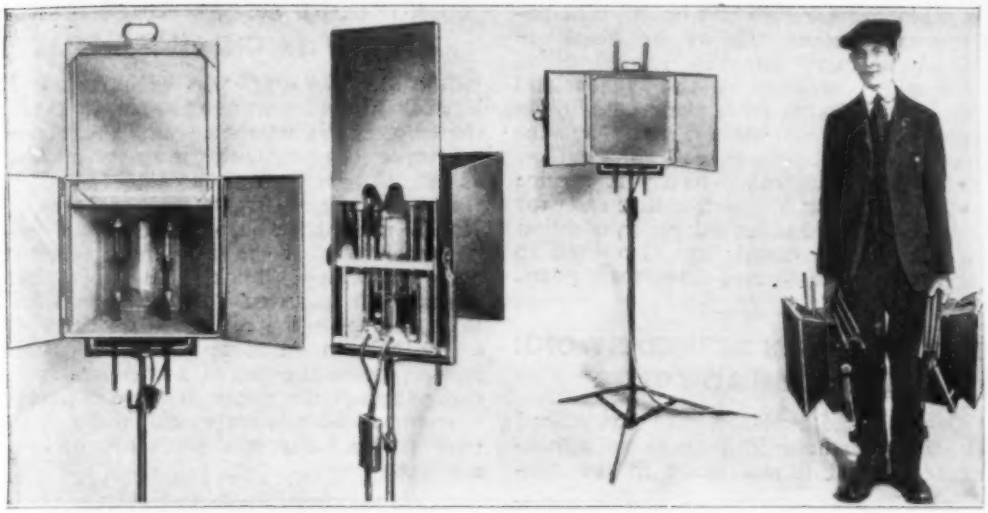
Chemists from every corner of the Dominion of Canada recently assembled in Montreal, and during a two days' session organized the new Canadian Institute of Chemistry. The new body is modeled after a similar institution in Great Britain, and will likewise have "fellows" and "associates" who will append to their names the letters "F. C. I. C." and "A. C. I. C.," respectively. The institute will also maintain a central headquarters where a member may consult a well-stocked chemical library, or learn from the official bureau the names of other chemists who may be able to help him in his work. In a general way, the institute hopes to raise the professions of chemistry and chemical engineering to equal rank with the other learned professions.

AUTO SERVICE BETWEEN THREE GREAT NATIONAL PARKS

Yellowstone, Glacier, and Rocky Mountain national parks are to be linked together, and to Denver, this season by an auto service established by the Department of the Interior. New seven and ten-passenger cars will travel a route through Boulder and Loveland, Col.; Cheyenne, Douglas, Caspar, Thermopolis, and Cody, Wyo.; and Livingston, Bozeman, Boulder, Townsend, Helena, and Chouteau, Mont. Road improvements contemplated for next season will add other cities to the itinerary, and probably other national parks to the system served. It is the plan of the department's National Park Service to encourage American resort touring.

FLOWERS MADE OF FEATHERS APPEAR REAL

Using feathers as material, an elderly French woman of New Orleans makes artificial flowers appear so real that they deceive the beholder at a short distance, however familiar he may be with the forms and colors of nature's varieties. A remarkable example of her work is a bouquet containing a brown-eyed Susan, a nasturtium, tea roses, wild roses, and others. For some shades of color she uses dyes in order to produce the natural appearance of petal or leaf, but most of the feathers are in their original hues.



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POWERFUL PORTABLE ARC LAMP FOR MOTION-PICTURE WORK

THIS photographer's arc is so light and compact that the man on the right has no trouble carrying two of them. In the view at the left the spun-glass diffusing screen is raised to reveal the twin arc, of magnesia-cored carbons. In the next view the back is open, exposing the automatic-feed solenoid in the center, and the two rheostat coils at the sides. Set up on its folding tripod, it is ready for work in the third picture. Motion-picture men find it powerful enough for their work.

CAMELS CARRY FOOD TO MEN ON INFLUENZA PATROL

Along the westernmost section of the 750-mile boundary between Queensland and New South Wales, Australia, stretches a high wire fence. For 150 miles it runs across parched desert plains, along stony ridges, and over bleak sand hills. It was originally erected to prevent migrations of rabbits into Queensland, and was later made higher to keep wild dogs out of New South Wales. But lately the fence has done extra duty in helping the patrol police in their efforts to stop the spread of the dreaded "flu," by preventing unnecessary travel across the border. The patrol work, which consists chiefly in guarding the various gates, has been accomplished despite the sizzling heat and the almost complete absence of natural

This Camel Train Carries Men and Supplies over the Parched Plains to the Lonely Sentry Posts along the Westernmost Section of the Boundary Line

Another View of the Camel Train Which Carries Rations to the Guards on the Desert Boundary Line: From Headquarters to the Farther End of the Fence Is a Little Less than 200 Miles

nourishment for man and beast. The police on the south side of the fence are forced to carry supplies for 40 miles, while the patrolmen on the Queensland side are separated from their base by so many miles of waterless desert that supplies have to be forwarded to them on camelback. The camel-transport service is maintained on a schedule that calls for travel of 20 to 50 miles a day. In addition to this service, camels are also used to carry the police to and from their posts.

TWO SHIPWAYS SERVED BY ONE HAMMERHEAD CRANE

One Great Lakes shipyard has placed its 10-ton hammerhead crane so advantageously that it can assist in the construction of two ships from a single track. This economy of space and operation is secured by placing the track for the great crane midway between the two shipways. As the crane has an effective radius of 95 ft., it can thus serve practically every point in either shipway. Within a radius of 50 ft., it can lift a load of 10 tons, and at the tip, a load of five tons.

This Ten-Ton Hammerhead Crane is Centrally Placed between Two Shipways So That It can Serve Both Equally Well. Its Great Radius of Action Enables It to Reach Almost Any Part of the Two Jobs

DANGEROUS OCEAN CURRENTS SPOTTED BY CHEMICAL TEST

The old "sea dog" will be horrified to learn that, as a result of an expedition into the tropical Pacific, the chemist's test tube may take its place with the sounding line as a navigating instrument. Traveling through the reef-strewn waters between Hawaii and Australia, the scientists made chemical tests of the dangerous easterly currents which "buck" the prevailing westerly drift, often forcing vessels off their course in the night to run the risk of destruction on some low-lying island. In every case the use of a chemical indicator showed the water in these countercurrents to be relatively acid, while ordinary tropical currents are more or less alkaline.

AIRPLANE TO UNITE ISOLATED TOWNS OF INTERIOR PERU

The Peruvian government has decided to bind more closely together the scattered communities on the eastern slopes of the Andes by means of regular airplane service, handling mail, passengers, and freight. It is possible that the first route will extend from the city of Huanuco, high in the Andes, northward along a branch of the upper Amazon, then eastward over passes in the high mountain ranges, to Iquitos, 500 miles away. Iquitos is 2,653 miles from the mouth of the Amazon River, yet is touched by many foreign ocean-going vessels, making it the center of the Peruvian river-transportation system.

PRIZES OFFERED FOR EMBLEM FOR AMERICAN LEGION

The American Legion wants an official emblem, suitable for wear on a coat lapel, and is offering prizes of $50, $25, $15, and $10 for the four most acceptable designs submitted before August 1. The emblem must be simple and capable of construction without the use of enamel, and the contest is open to everybody. Charles Parsons, 663 Downington Avenue, Salt Lake City, is secretary of the Emblem Committee.

¶Iceland's traditional isolation has vanished with the erection of a wireless station which now receives daily press bulletins from Scandinavia, England, France, and Germany.

This Dead Whale was Washed Up on a Florida Beach. It Was of an Arctic Species and had Probably Met Death in Collision with a Ship

FORTY-SEVEN-FOOT WHALE FOUND ON PABLO BEACH

Recently a workman at Pablo Beach, Fla., found a whale measuring 47 ft. 3 in. in length. The monster had been washed ashore and was dead, wounds indicating a ship had struck it, or that it had been attacked by sharks. It is said that it was of the arctic or Greenland variety of whale, which when full-grown attains a length of 45 to 50 ft. Since these whales seldom venture beyond the southern limit of drift ice, it probably met with death in northern waters.

RAISE SUNKEN DREDGE BOAT WITH COMMON JACKS

A dredger grown old in its service along western waterways suddenly gave up the job one day and sank in 35 ft. of water. It was not much of a loss, as a boat, but its equipment was worth $75,000, and the hull obstructed the channel. Skillful divers managed to loosen the bolts of the engine and the 70-ton boiler, and a derrick on shore salvaged them. Raising the hull was a more difficult task. Heavy chains were worked under it and their ends brought up to two barges moored alongside. Huge beams, to which the chains were attached, were then gradually raised by means of house movers' jacks, which were readjusted after each foot or so of lift. The job was finished in 20 days.

An Extensive Wall of Canvas was Erected to Screen the Big Carcass from the Public Eye during Preparations for Interment

The Method of Salvaging the Old Dredge is Shown at the Left: Heavy Chains, Passed under the Hull by Divers, were Secured to Beams on Barges at Either Side. The Beams were Then Raised with House Movers' Jacks. The Equipment at the Right was First Removed by a Derrick on the Shore

SMALL ICE SHEDS MAKE DELIVERY ECONOMICAL

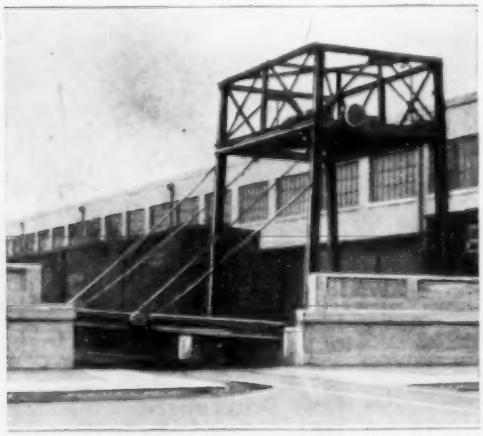
Small wooden buildings whose interiors are fitted as refrigerating rooms are stationed at intervals throughout the resi-

This Is One of a Series of Refrigerated Sheds Which are Scattered through the Heart of a Californian City and from Which Local Ice Wagons are Loaded. Each Station Has a Capacity of Several Thousand Pounds

dence district of a western city. These are supplied from big trucks which deposit several thousand pounds at a time. The local wagons, in turn, are filled from these stations.

DRAWBRIDGE ACROSS TRACK SAVES VALUABLE TIME

A drawbridge several miles from navigable water may seem entirely uncalled for, but such a bridge is used in connection with a southern California warehouse. A spur railroad track runs down the center



The Drawbridge Connects Two Elevated Loading Platforms of a California Warehouse and is Lifted to Permit Use of the Spur Track Which It Spans

of the warehouse yard, and to save time in unloading, platforms level with the car floor were built on each side of the track. Whenever it was desired to get a truck from one platform to another, it was necessary for it to go down off the platform, drive round the block, and go up the incline to the other. This took 10 or 15 minutes of valuable time. The difficulty was eliminated by constructing several small drawbridges over the track. When it is desired to move the train these are simply lifted up.

WOODEN PAVING BLOCKS BULGE IN TORRENTIAL RAINSTORM

A rainstorm of an intensity seldom seen outside the tropics visited Pensacola, Fla., not long ago. Little or no damage was done by the accompanying wind or lightning, but the volume of water dropped upon the city was so tremendous that gar-

The Swelling and Disruption of the Wooden-Block Pavement Was the Most Curious Damage Done by the Great Rainstorm Which Recently Fell upon Pensacola, Florida

dens were washed away, sand and clay-surfaced roads ruined, and railroad tracks inundated. The city engineer took most interest, however, in the misbehavior of the wooden-block pavement. Everywhere it expanded, bulged, and fell back in a hopeless jumble, menacing traffic and throwing street-car tracks out of alinement.

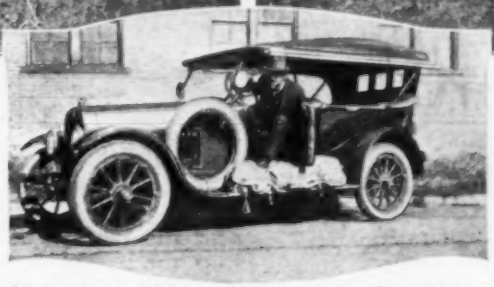
PICKLED SEAWEED LATEST OF TABLE RELISHES

Seaweed, at least in some of its various forms, is not only edible but declared to be really delicious when properly pickled. A scientist in the government service in California has developed a process for pickling the kelp of the Pacific coast, and Los Angeles stores are already offering it, put up in bottles.

SEVEN-ROOM TENT HOME FOR MOTORISTS

The Owner has Lifted a Corner of the Tent Home, Disclosing a Bedroom

The Garage of the Tent Home will Conveniently Shelter a Touring Car

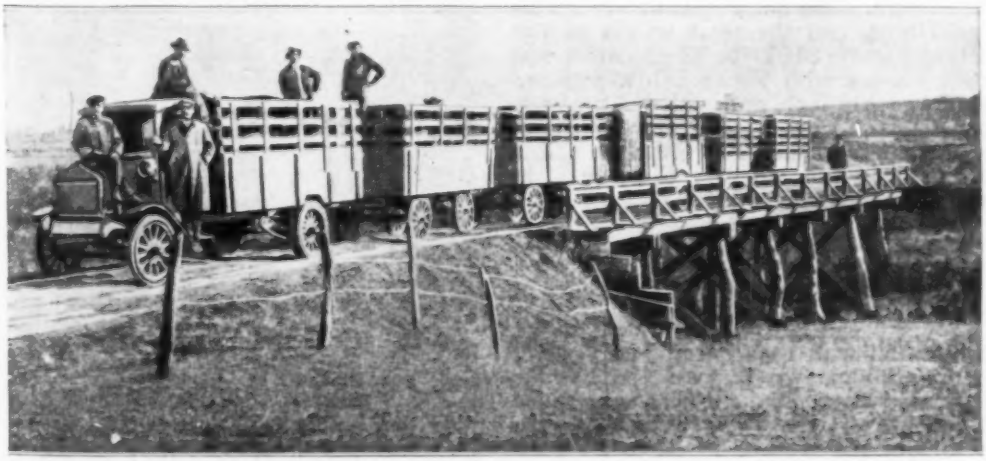


Made of the Lightest Materials, the Tent Weighs Only 124 Pounds, and may be Collapsed to Small Compass and Lashed to the Running Board

The up-to-date cross-country motorist may now equip himself with a most elaborate roadside home. Weighing complete only 124 lb., the entire equipment may be lashed to the running board; yet, when erected, it will furnish four bedrooms, a 7 by 11-foot dining room, with a similar room for general purposes, and a 20 by 6¾-foot garage. Screened windows with storm flaps keep out mosquitoes and bad weather. Another feature which recommends this new accessory is the fact that the tent is not dependent on the auto for support. Hence the family may take an evening ride to the local movies, or other trip, after the labor of pitching tent and cooking supper. The garage will shelter one large seven-passenger car.

MOTOR-TRUCK TRAIN CARRIES FIFTEEN TONS

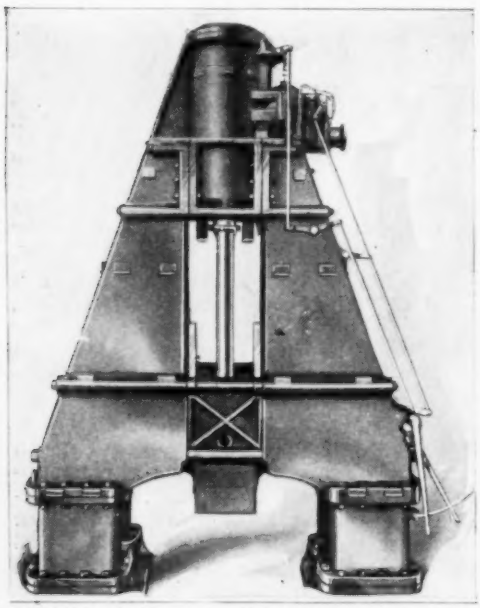
In Texas a cattle train consisting of a two-ton motor truck and five trailers has been used in transporting 70 head of sheep and 17 head of steers from Farmersville to Fort Worth, a distance of 90 miles. Twenty-two miles of the road was traveled through heavy mud. The net weight of the animals making up the cargo was 29,500 lb., and the motor train was about 100 feet long.



This Auto-Truck Train Made a Recent Trip over a Texas Roadway. Seventy Sheep and 17 Steers Burdened the Two-Ton Truck and the Five Trailers, but the Journey was Made with Gratifying Ease

LARGEST DOUBLE-ACTING STEAM FORGE HAMMER IN U. S.

The largest double-acting steam forge hammer ever built in the United States is a 40-ton, double-frame, having a cylinder of



This Massive Forge Hammer Weighs 600 Tons and can Deliver a Blow of 8,000 Tons. Dismounted at the Factory, It was Shipped to the Purchaser on 14 Railroad Cars

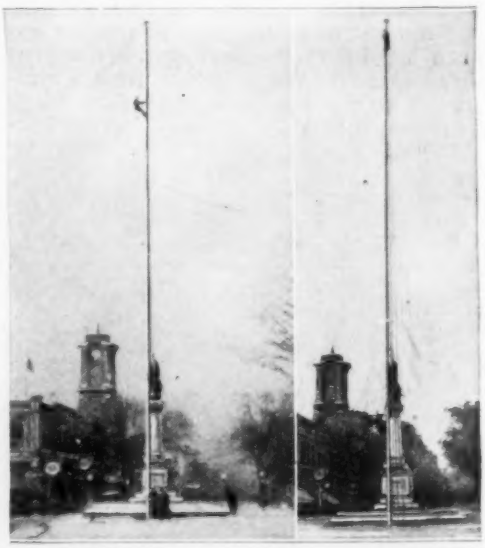
40-in. bore and a 96-in. stroke. The main pipe is 10 in., the exhaust 14 in., and the large piston rod 15 in. in diameter. The ram is 51 in. wide, 66 in. front to back, and 72 in. high, and is notched to handle a steel die, 72 in. long, 41 in. wide, and 28 in. high. The die weighs approximately 10 tons, and the total weight of the falling parts is 80,000 lb. The hammer was built for use with 100 to 150-lb. pressure to the square inch, and with full pressure can deliver a blow of 8,000 tons. The total weight of the hammer is 600 tons, and it required 14 railroad cars to move it in sections when shipped.

SERBIAN CANAL TO CONNECT DANUBE WITH ÆGEAN SEA

To give the Serbian hinterland direct connection with the Ægean Sea, Greater Serbia is about to construct a 375-mile waterway from the Austrian village of Kevevara, on the Danube opposite the mouth of the Morava River, to Saloniki. Following the course of the Morava into the mountains, the route then crosses by canal to the headwaters of the Vardar River. It follows this stream to a point near the mouth, whence a short canal takes it into Saloniki. The rise from the Danube to the top of the divide is nearly 1,000 ft., and the drop from the other side to Saloniki about the same, making necessary at least 65 locks. It is estimated that 1,000-ton barges will require eight days to travel the full length. The cost of the entire undertaking is expected to exceed 80 million dollars.

BENT STEEL FLAGPOLE CUT OFF AND SPLICED

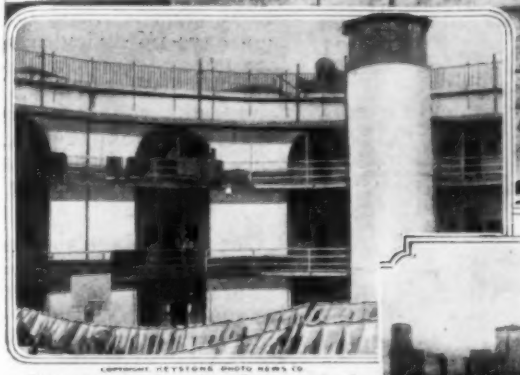
Patriotic citizens of Battle Creek, Mich., celebrated the first Liberty loan by erecting a steel flagpole, 123 ft. high. Last Thanksgiving Day a strong windstorm bent the pole to an angle of 45°, 44 ft. from the top. The local steeple jack was employed to cut off the 44 ft., and from this piece he cut 8 ft. more to remove the bent portion, leaving 36, with which he made a 5-ft. splice onto the lower section, so that the pole now stands 110 ft. above the ground. The ball originally carried on the top of the pole was 2 ft. in diameter, but it has been replaced by one only 1 ft. in diameter. To place the new ball the steeple jack made a special trip to the top, and painted the pole as he slowly descended to the ground.



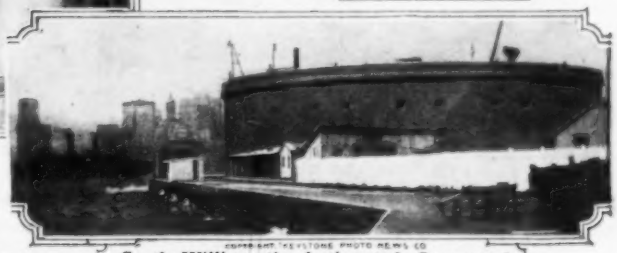
The Steeple Jack is Shown, on the Right, at Work on the New Ball. During the Descent from His Hair-Raising Position He Painted the Long Pole, as Pictured at the Left

MILITARY OFFENDERS CAGED IN ANCIENT FORTRESS

The Famous Sky Line is Seen behind the Sentry on the Wall of Old Castle William. Here, in Busy New York Harbor, the Government Confines Many of Its Military Prisoners



This Is the Circular Courtyard of Castle William, Showing How the Three Tiers of Gun Casemates have been Transformed into Cells for Offenders against the Army Law. Constant Watch is Kept from the Tower

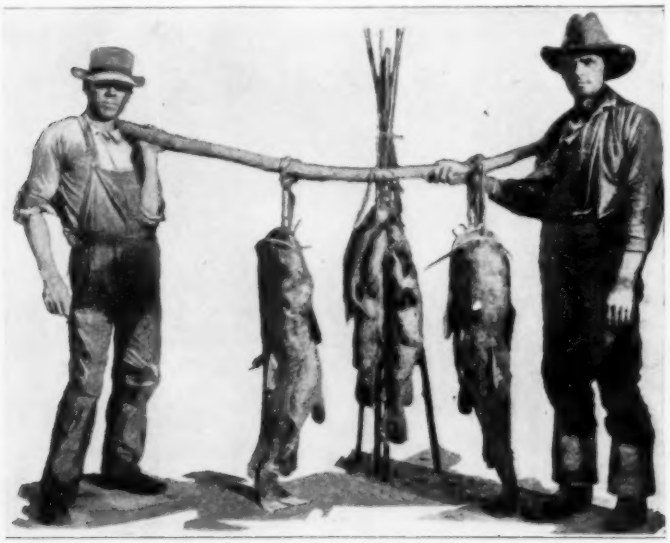


Castle William, the Antiquated, Casemated Fortress Which has Guarded New York Harbor for More than a Hundred Years

Stormy Discussion of the Alleged Injustice of the Army Court-Martial System Lends Particular Interest to This Picture of the Noonday "Check Roll Call" at Castle William. Many of These Prisoners have Just Returned from France; Others have Offended in the United States. All of Them have been Granted a Rehearing by the Commanding Officer, Who has Often been Able to Reduce Their Sentences

FISHERMEN GET GIANT "CATS" BY WHALING METHODS

A couple of market fishermen of southeastern Kansas are catching big river "cats" with tackle that somewhat resembles an old whale fisher's equipment, except that enormous barbed hooks take the place of harpoons. Each hook has a socket instead of the usual eye, and is held by friction on the end of a long pole, to which it is also fastened by two feet of stout cord. Familiar with the habits of the giant catfish, the men have no difficulty in locating the holes where they lie. When a fish is "snagged," the jerk detaches the hook from the pole, and the captive is played until it gives up.

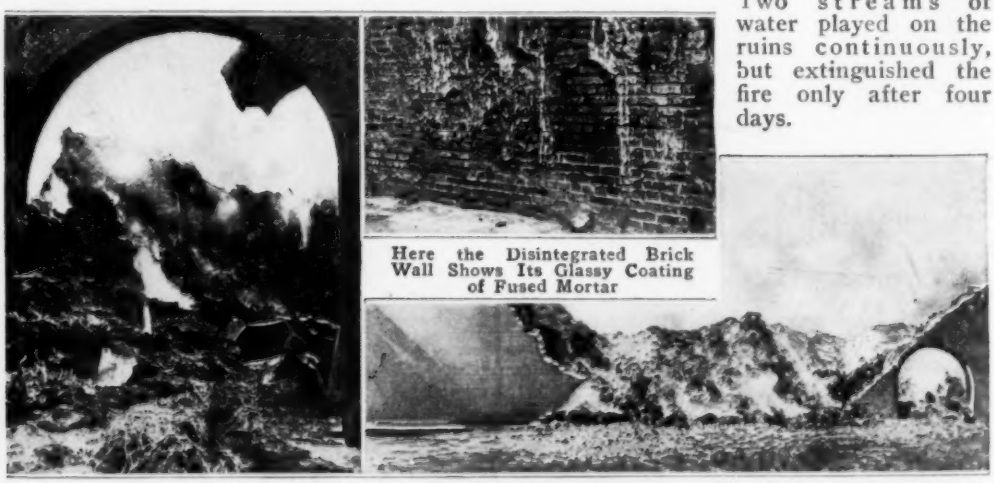


These Kansas Fishermen Capture the Big Catfish by a Method of Their Own, "Snagging" Them with Great Hooks on the Ends of Long Poles. The Catch Shown Here Weighed About 120 Pounds, and was Taken in Less than an Hour

¶ One of England's great railroads is painting the handrails on its brake freight cars in white enamel so that they may be easily seen by the trainmen at night.

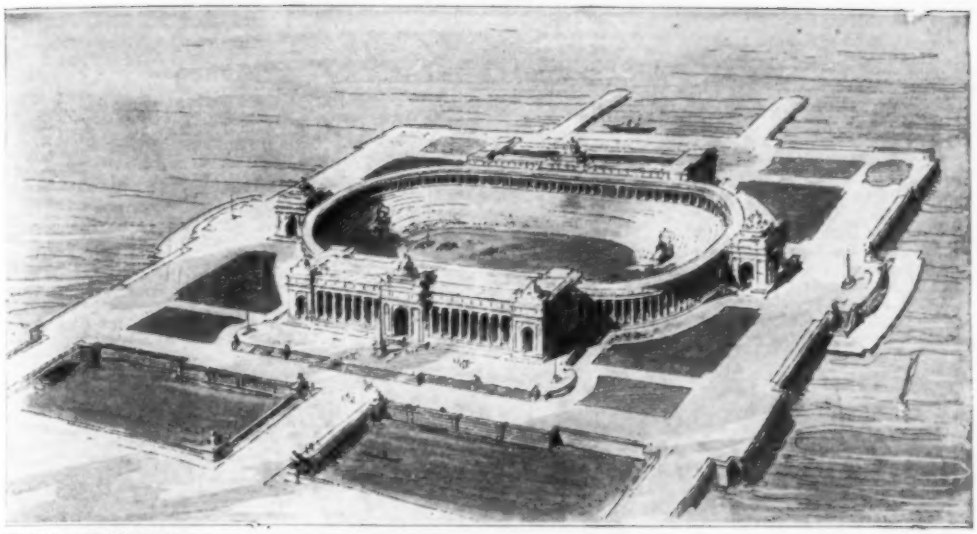
FIERCE HEAT OF BURNING HAY MELTS BRICK WALL

Because of its high proportion of contained air, stored hay burns furiously and with extreme heat. When the hay which filled a large brick warehouse at Los Angeles, Calif., caught fire recently, the wall on the street side collapsed in three hours. Examination of the brick surface after the fire revealed a glassy mass of fused mortar, while even the bricks themselves had not wholly resisted the terrific heat. Two streams of water played on the ruins continuously, but extinguished the fire only after four days.



Here the Disintegrated Brick Wall Shows Its Glassy Coating of Fused Mortar

Hay Stored in a Los Angeles Warehouse Burned at Such a High Temperature That the Brick Walls Crumbled and Collapsed in Many Places. Inspection of the Few Surviving Sections of the Walls Showed That in Many Places the Mortar had Fused, Covering the Brick with a Glassy Coating



MARSHALL & FOX, ARCHITECTS

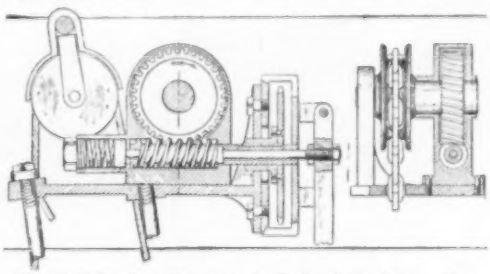
Perspective Plan View of the Great Stadium Proposed as a Chicago Memorial to Local Men Who Lost Their Lives in the War: It is Planned to Cost $10,000,000 and will Seat 100,000 Persons

CHICAGO PLANS HUGE STADIUM AS SOLDIER MEMORIAL

A mammoth stadium, to seat 100,000 persons, to cost $10,000,000, and to be built wholly by returned fighting men, is the memorial Chicago proposes to erect in honor of its soldier dead. Grant Park, on the city's lake front, is the location contemplated for the great work, general plans for which already have been drawn. Arches, 90 ft. in height, giant pillars, and imposing colonnades will inclose the vast ring of terraced seats, whose central field will accommodate the most elaborate of ceremonies, conventions, or athletic events. Halls at the ends of the façade will seat additional thousands under cover. The idea of the memorial is to combine usefulness with magnificence, and to pay tribute to those gone by attracting new life to the Garden City. Popular subscription is expected to defray the cost.

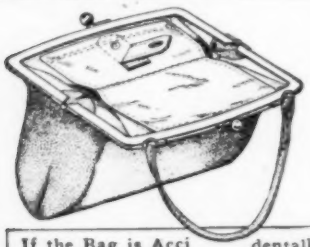
WORM DRIVE IN AUTO HOIST DOES DUTY AS BRAKE

In his patented hoist for auto-truck dump bodies, an inventor has introduced several interesting features. Among them is an unusual mechanism, placed immediately behind the driver's seat and about five feet above the chassis frame, which acts as both worm drive and brake. Thus, to tilt the body and dump the load, the worm gear in the center of the larger drawing is turned by power from the driving shaft. The worm revolves a gear, which is marked in the drawing with a small arrow. Fixed to the gear is a drum, as shown in the smaller drawing. As the gear turns, a chain is wound on the drum, thus raising the front end of the truck body. When the body has been raised to its desired inclination, motion automatically ceases. And at this point, the coil spring, seen at the left of the worm, exerts such heavy pressure against the end of the worm that the entire gear system becomes a brake, and the body is held in dumping position while the load slides off. To return the body to the horizontal, the operator pushes home the lever, seen at the right of the larger drawing, thus compressing the coil spring by means of a rod which extends through the hollow worm gear. Friction between the broad teeth of the two gears is thus eliminated and the body falls into place.

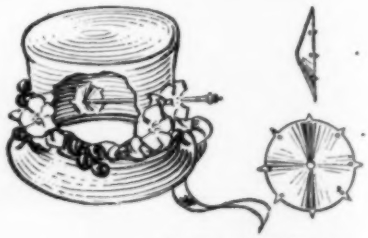


The Coil Spring, Seen at the Left of the Worm Gear, Holds the Auto Dump Body in Its Inclined Position While the Load Slides Off

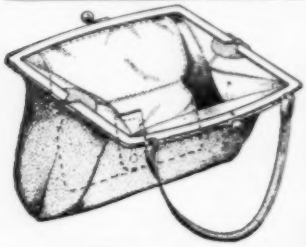
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



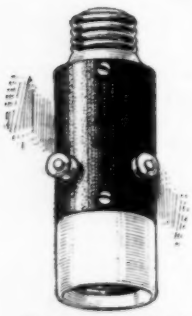
If the Bag is Acci dentally or Mischievously Opened, the Contents are Still Protected by the Flap and Its Buttonholed Tab



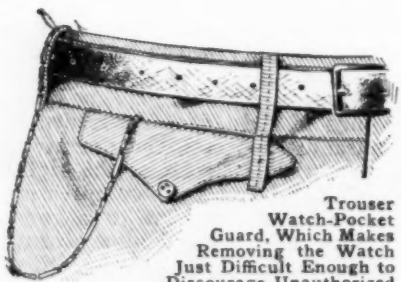
A Patented Hatpin Guide Sewed into the New Hat Assures That a New Hole will Not Appear Every Time It is Worn



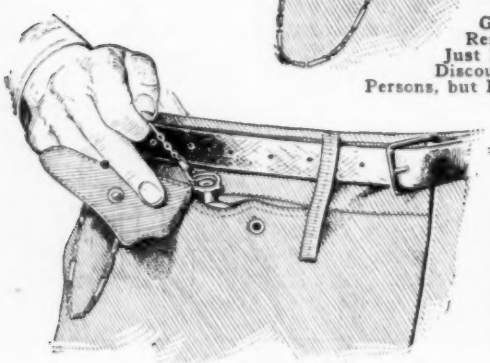
Fit Companion for the Familiar Traveler's Electric Iron Is a Three-Pound Aluminum Folding Ironing Board, Which Goes into the Suitcase

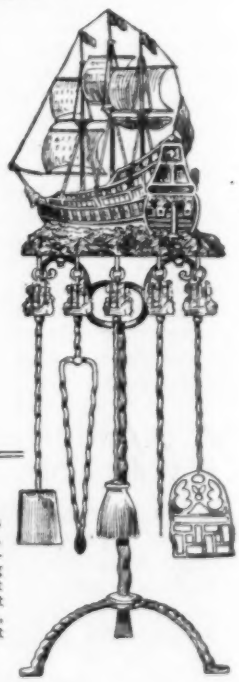


Doorbell-Ringing Transformer That Screws into Any Lamp Socket: The Lamp Then Screws into the Other End, Making It Easier to Install Than a Dry Battery

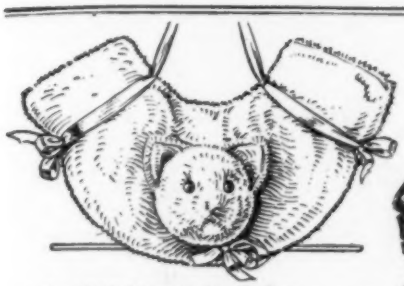


Trouser Watch-Pocket Guard, Which Makes Removing the Watch Just Difficult Enough to Discourage Unauthorized Persons, but Easy for the Owner

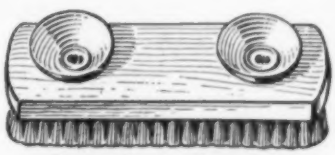




This Spanish Galleon Serves to Guard the Fireplace, Whose Flickering Rays, Reflected from Its Brass, Bring Dreams of Adventure, Not Dispelled by the Quaint Toaster, Tongs, Shovel, Poker, and Brush That Depend from the Base



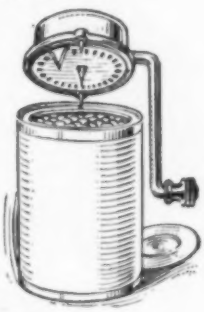
An Odd-Shaped Muff for Children That Fits Little Hands Better than a Straight Cylinder, and Has a Teddy-Bear Head for Company



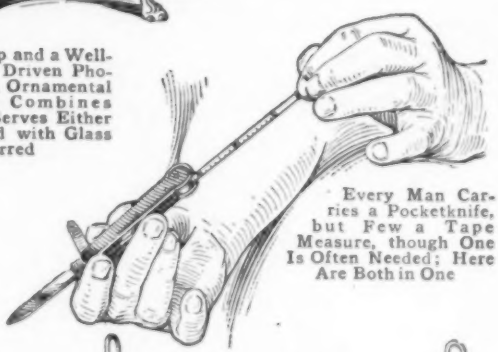
Rubber Suction Cups on the Back of This Nail Brush Fasten It to Wash Bowl or Mirror, so a One-Armed Person can Use It

Mason Jars are Easily and Safely Handled in Hot Water, Even in the Dark, with a Pair of Tongs made for the Purpose

A Beautiful Table Lamp and a Well-Designed, Electrically Driven Phonograph Are One in an Ornamental Home Utility Which Combines Light and Music, or Serves Either Alone. It may be Had with Glass Shade if Preferred



Here Is a Can Opener that Cuts the Top Right Out of the Can in a Few Seconds by Simply Turning the Crank



Every Man Carries a Pocketknife, but Few a Tape Measure, though One Is Often Needed; Here Are Both in One

Little Stepladder, Just Right for Reaching Curtain Rods and Ceiling Corners—or an Equally Handy Kitchen Stool, Which Folds Compactly for Storing

Tray for Putting Up Fruit: During Cooking It Rests on the Bottom of the Boiler, and Afterward is Lifted to the Position Shown

STRIP OF METAL ON DRY CELL MAKES IT A FLASH LIGHT

A flash-light attachment for standard dry cells has been reduced to the simplest possible terms by a New York State inventor. It is merely a bent strip of metal, one end of which clamps to the carbon post of the cell, while the other end is bent over the zinc post and carries the lamp bulb, in either vertical or horizontal position. Thumb pressure on the end makes contact between the lamp and the zinc post. The lamp holes have upset edges in place of threads, and a slot in the metal gives them a spring grip on the lamp base.

SIMPLE ADJUSTABLE WRENCH FOR HEXAGON NUTS

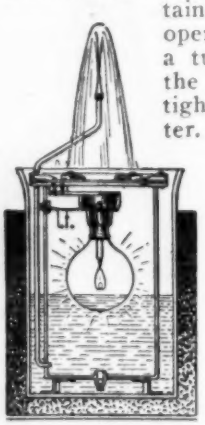
There is little affinity between an ordinary monkey wrench and a hexagon nut; so an Oklahoma inventor has devised a specialized wrench, particularly adapted to spark-plug work, and consisting of a sliding sleeve on a slotted bar. Between the end of the slot and the sleeve, four of the nut's six sides are tightly clamped by a screw centered in the handle. This simple, straight tool will fit nuts from 3/8 to 1¼ in. in size.

AERIAL PHOTOGRAPHERS TO BE TRAINED IN RECRUIT SCHOOL

Experience in France has taught the chiefs of the United States Army to place such high value on aerial photography that a permanent school will be established in Virginia for instruction in this service branch. Here will eventually be sent all recruits for this branch of the service, to learn the use of this "eye of the army" which pierces the enemy's cleverest camouflage over trench or gun emplacement. As an inducement to service of this sort, recruiting authorities point out that the trained aerial photographer would be certain of employment on discharge from the army. He should be able to use his craft in making maps, in plotting surveys of inaccessible areas and of great construction projects, in studying coast lines and coastal waters, and in half a hundred other ways. Job-hunting young men are also reminded that an increase of 50 per cent in pay is allowed those on "flying status." Thus, for instance, a "flying" private draws $45 instead of $30, and a master electrician $121.50 instead of $81 a month.

SMALL FOUNTAIN OPERATED BY INCANDESCENT LAMP

A pump of some kind is generally considered necessary to a self-contained fountain; but an Ohio inventor operates one by the heat of a tungsten lamp placed in the upper part of an air-tight jar half filled with water. Expansion of the air when the lamp is turned on sprays the water through a nozzle at the top. Returning, it runs into an outer compartment of the jar. When the current is turned off, contraction draws the water back into the center container through a valve.



MAKES ADJUSTABLE BOOTJACK FROM A SINGLE STRAP

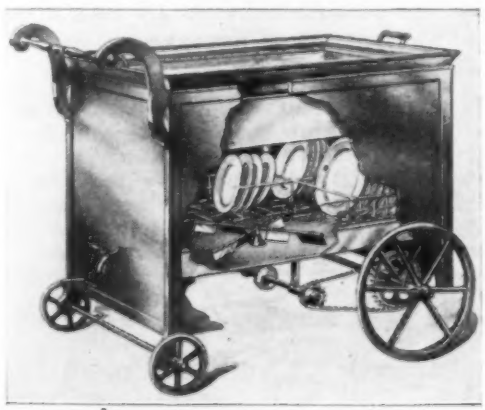
Army boots restored interest in the bootjack, and one has recently been patented which is made from a single strap. Metal rings shape it into two loops, one of which is placed about the heel of the boot to be removed. When tightened, it is held by friction between two of the rings. Pushing with the other foot in the other loop pulls the boot off.

YEAST MADE IN BREWERIES GOOD WHEAT SUBSTITUTE

That a brewer's vat may serve as an efficient substitute for a wheat field is the latest suggestion of science calculated to shine through the gloom that hangs over the brewery business. Yeast, which can readily be grown in such a vat, is declared to possess many of the food properties of wheat. It is also a nutritious substitute for meat, and not far removed in food value from cream and butter. As prepared for eating, the yeast is dried at a temperature of 221° F., and one part is used with four of wheat to make bread. It may also be mixed with other dishes, adding palatability as well as nutriment. The tiny plants which compose the yeast family are really a form of fungus, and grow with tremendous rapidity.

TEA WAGON AND DISHWASHING MACHINE ARE COMBINED

The latest application of genius to household management has resulted in a combination of tea wagon and dishwashing machine. Below the usual tray is a steel tank, with a paddle on the bottom actuated by a sprocket drive from the main axle. After the meal, the tray is lifted off, the soiled dishes are placed in a wire rack immediately above the paddle, and the wagon is pushed to the kitchen. Here the tray is replaced by a water reservoir, and enough boiling water is passed through the dishes to cover the paddle. A few trips across the kitchen floor, and the dishes are done.



The Combination Tea Wagon and Dishwashing Machine is Here Shown with the Dishes Cleaned and the Dirty Water Drawn Off through the Spigot at the Left

ELECTRIC HOT PLATE WARMS FEET OF NAVY MEN

Many navy men find it easier to stand long, cold watches since the government furnished electric foot warmers to various battleships and other boats. The flat, corrugated-iron plate measures 14 by 20 in., with the heating coils fastened underneath and so thoroughly waterproofed that the plate may be placed in positions exposed to the spray and waves. For use on the bridge, it is also supplied in a non-magnetic material which will not affect the action of the compass needles.

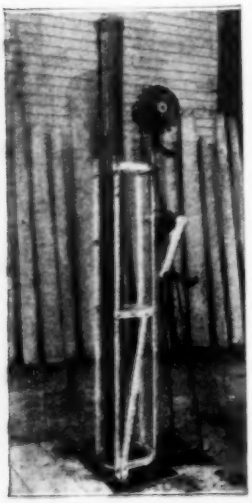
This Electric Hot Plate is Designed to Warm the Feet of Navy Men on the Bridge and Even in the Crow's Nest. The Coils Are Waterproofed and Hence Not Affected by Immersion in Salt Water

BIG FRENCH RADIO STATION HAS VARIED EQUIPMENT

The mammoth wireless station at Lyons, France, with its 1,400-kw. capacity, is now practically finished. Its engineers have taken full advantage of all recent developments, and six types of transmitting equipment are installed, each in duplicate. The receiving apparatus, housed in soundproof rooms, is equally complete. The enormous antenna stretches north and south for 2,400 ft., on eight steel towers, 650 ft. high, and consists of 20 separate strands of cable, a total of more than nine miles of phosphor-bronze wire. Each strand is connected to a switch contact in the building, enabling different combinations of wires to be used. Both French and American apparatus are installed, the latter including two 250-kw. arc-oscillation generators, a 150-kw. radio-frequency alternator, and a 150-kw. arc generator used for official communication with the American station at Arlington.

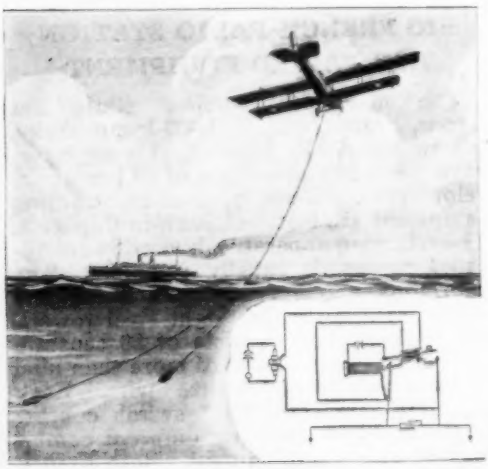
CONCRETE POSTS MOLDED IN HOLE IN GROUND

A 5-ft. hole in the ground, or under the barn floor, makes easy the molding of concrete fence posts with a new type of hand machine. The mold, placed in a carrier, is lowered into the hole with a crank and chain, and then filled. Further turning of the crank agitates and compacts the mixture. The mold may then be lifted out and another substituted. The post is left in the mold for 24 hours and is then stored a month or two for seasoning. Standard posts have 5-in. butt, 3½-in. top, and 7-ft. length, weighing 75 lb., and two men turn out eight an hour.



ELECTRODES IN THE SEA SEND SIGNALS BETWEEN AIR CRAFT

Seaplanes and other air craft flying over water can readily communicate with each other and with fixed stations by means of a simple British invention. A dangling cable carries two ground plates which drag in the water a sufficient distance apart to serve as terminals for an elementary form of wireless system. An interrupted current sent into the plates affects other similar plates not too distant, code messages being sent with a telegraph key.



By Dangling a Cable with Two Terminals in the Sea, This Airplane can Send and Receive Signals, Using the Circuit as Diagrammed

AIR SERVICE HELPS CITIES BUILD AVIATION FIELDS

The Air Service of the United States Army is attempting to foster aerial activity, both military, postal, and commercial, by coöperation with cities throughout the nation in laying out municipal aviation fields. Because of their location on important air lanes 32 cities and towns have already been selected for the establishment of these aerodromes. Each has been supplied with detailed instructions and with blueprints explaining the official layouts. The prescribed fields average about 60 acres in area, and are either square, rectangular, or L-shaped. Great white letters and numerals, 15 ft. high, will be placed in the northwest corner of each as a means of identification. One of the strictest requirements imposed by the air service is that the fields be so located as to be capable of expansion and development in the future. This regulation seems to indicate an official belief in the growing use of the huge, multimotored planes which are constantly being made larger and larger.

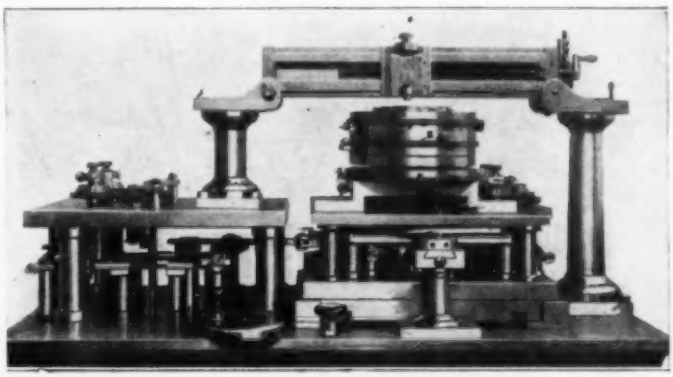
RAISE SUNKEN LOGS IN CANADA BY NEW METHODS

To recover from the bottom of Canadian streams the sunken logs that are lost while on the way from the logging camps to the mills, a newly organized corporation will employ machinery specially adapted to the purpose, instead of the ordinary devices used for moving timber. Compressed air and high-pressure water streams will be used to loosen the logs. As 10 per cent of the logs cut sink and remain imbedded for various periods without losing their value by deterioration, the business of raising them should prove to be one of great commercial importance to lumbermen.

¶About 5,000 tons of margarine, made according to government formula and sold at less than one-third the price of butter, are manufactured by British factories every week.

GEOMETRIC LATHE WILL MAKE PLATES FOR MEXICAN MONEY

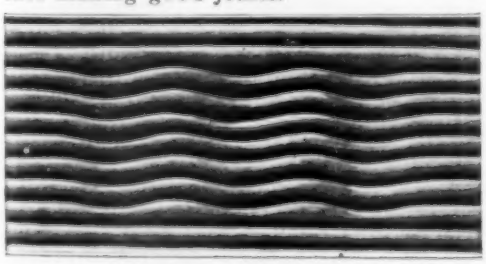
It took two years to make a geometric lathe just completed by a New Jersey firm for the Mexican government's bureau of engraving. The machine is used to turn, on steel dies, the inimitable cycloidal and interwoven patterns that decorate and protect paper money, bonds, etc., but the production of any particular pattern means extensive calculations by mathematics, and one to three days' preparation. Four feet long and weighing 1,500 lb., the lathe is so sensitive to vibration that a special concrete foundation has been prepared for it. All shafts run in ball-bearings, of which there are about 130; and the various movements of the work chuck are timed by 185 bronze change gears of 40 teeth to the inch. A ⅛-hp. electric motor drives two easily running main vertical shafts through steel spiral gears. The cutting tool is fixed, producing, as the chuck plate oscillates beneath it, exceedingly fine scrolls, squares, or ovals, accurate to the fraction of a thousandth of an inch, and which cannot be duplicated. The machine is valued at $15,000.



This Is a Geometric Lathe Just Completed for the Mexican Government, and Used for Making the Intricate Scroll Figures on the Plates Designed for Printing Paper Money and Bonds. It Makes Square, Oval, or Circular Patterns Which cannot be Imitated

CURVING ROOF CORRUGATIONS KEEP SNOW FROM SLIDING

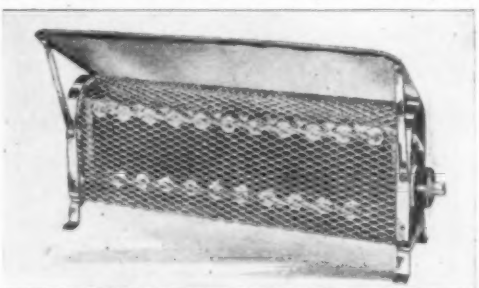
With a heavy snowfall on a metal roof there is always danger of a sudden slide breaking the snow guard and causing trouble. A Pennsylvania sheet-metal dealer has improved the situation by inventing a roof sheet with its corrugations serpentine in contour. The packed snow, unable to follow the curves or to lift itself over the ½-in. ridges, remains where it is, a uniformly distributed load, and slowly melts. The waterflow from it, retarded by the curves, does not overleap the eaves trough. Straight portions formed on the edges of each sheet facilitate making good joints.



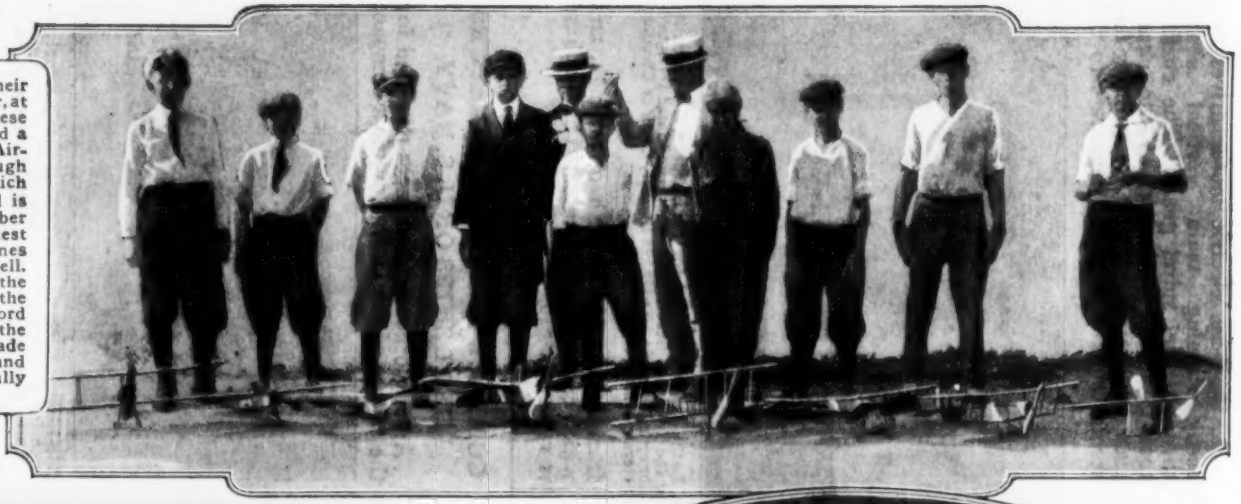
Sheet-Metal Roof Plate with Curved Corrugations, Which Prevent Snow Slides and Retard the Rush of Water

COMPACT ELECTRIC RADIATORS HEAT SHIPS OF U. S. NAVY

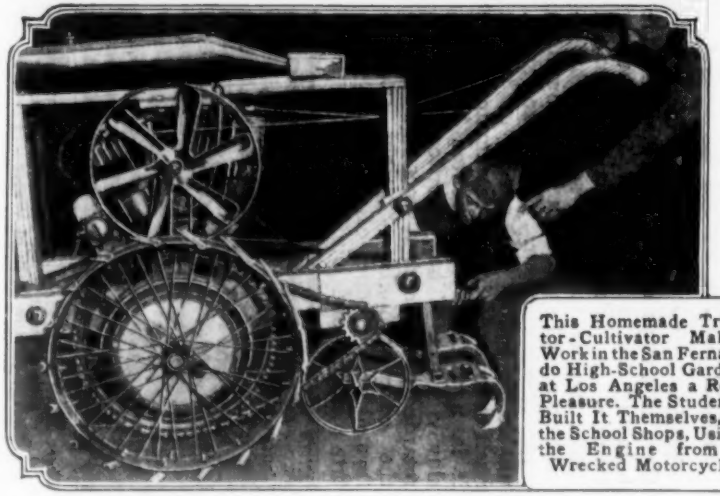
Among other conveniences provided for the sailors of the U. S. Navy is a compact electric radiator now in use on several battleships. As with everything else on shipboard all frills have been removed, and dimensions cut to three feet in length by one and a half feet in height. The addition of a deflecting shield at the back has been found to increase heating capacity by preventing heat absorption by the steel partitions of the ship. The coils may be adjusted to consume a variable amount of current.



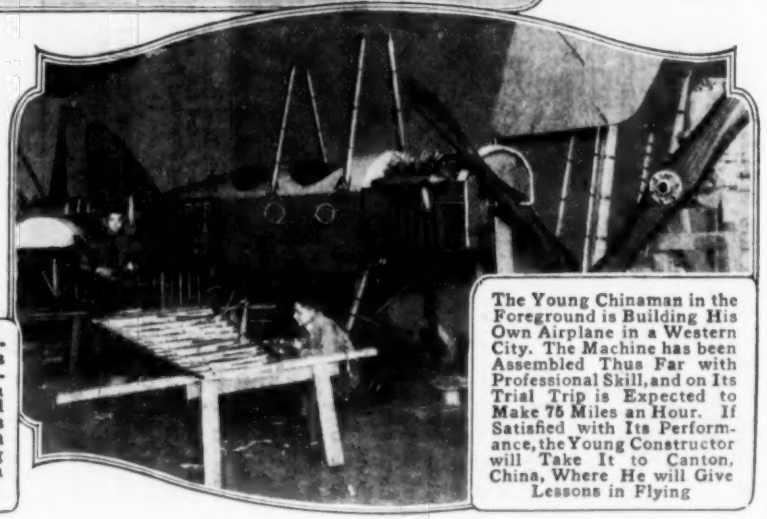
This Electric Radiator Is of Simple, Sturdy Construction for Use on Ships of the U. S. Navy. It Is Three Feet Long by One and a Half Feet High



Under the Guidance of Their Manual-Training Instructor, at St. Petersburg, Fla., These Nine Lads have Constructed a "Squadron" of Miniature Airplanes. Each is Drawn through the Air by a Propeller Which Runs on Ball Bearings and is Turned by Twisted Rubber Bands. In a Recent Contest Every One of the Little Planes Performed Remarkably Well. The Second Plane from the Left Won First Place in the Distance Trials with a Record of 108 Feet; Fifth from the Left Is the Ship Which Made the Best Landing; and Seventh, the Most Carefully Built Model



This Homemade Tractor-Cultivator Makes Work in the San Fernando High-School Garden at Los Angeles a Real Pleasure. The Students Built It Themselves, in the School Shops, Using the Engine from a Wrecked Motorcycle



The Young Chinaman in the Foreground is Building His Own Airplane in a Western City. The Machine has been Assembled Thus Far with Professional Skill, and on Its Trial Trip is Expected to Make 75 Miles an Hour. If Satisfied with Its Performance, the Young Constructor will Take It to Canton, China, Where He will Give Lessons in Flying

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This House Cat Returned from a Ramble with the Little Cottontail between Her Jaws. The Youngster's Legs Are So Long That the Cat Finds It Hard to Foil His Frequent Dashes for Liberty

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Thirty Children Recently Helped This Woman Celebrate the Birthday of Her Pet Lion. While the Guests Ate Ice Cream and Cake, "Pershing" Munched a Juicy Steak

Zoölogists are Trying to Learn What Brought This Little Seal into Delaware Bay, Where He was Found by a Boy. This is Believed to Be the Only Specimen Ever Discovered So Far from Its Northern Home

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Although This Patient Dog Had a Large Family of Her Own to Support, She Agreed, after a Little Coaxing, to Accept Another Member Who was Suffering for Want of a Mother's Care. This Was the Baby Seal Who is Seen in the Photograph being Treated on a Basis of Perfect Equality

MEASURING FLOW OF SMALL MOUNTAIN STREAM

In localities where water is scarce, legal contests are sometimes fought over the smallest streams. An affair of this sort recently made it necessary to measure the flow of a mountain brook. A miniature waterfall in the course of the stream was recognized as the most convenient place for the measurement. The brooklet was made to fill a 10-gal. bucket while a disinterested observer caught the time with a stop watch, making it easy to determine the rate of flow.

A 10-Gallon Bucket and Stop Watch Soon Measured the Flow of This Disputed Mountain Stream

TREES GROW IN SOIL BROKEN BY FERTILIZING CARTRIDGE

Wild flowers and other vegetation seem to grow with exceptional rapidity in the shell-torn soil of No Man's Land. Believing this to be the result of the division of the soil into fine particles, and its impregnation with nitrates from the explosive, two experimenters have designed a fertilizing cartridge which blasts a cavity about a yard deep. After the soil has absorbed the gases produced by the explosion, a tree is planted in the hole. Working with cherry trees, the experimenters have recorded a gain of 100 per cent in rate of growth in this broken soil. Their cartridge is made of cardboard rolled in conical form. At the point is the detonator, and down the axis runs the core of explosive. Surrounding the core is the fertilizer considered most beneficial for the soil in question.

STEEL

By LYDIA M. D. O'NEIL

I am the plow that turns the sod or ever
the wheat may grow;
I am the harrow that breaks the clod, and
the strength of the blades that mow.
I am the ax that fells the tree, and I am
the saw that sings;
I am the hammer that drives the nail, and
I am the nail that clings.

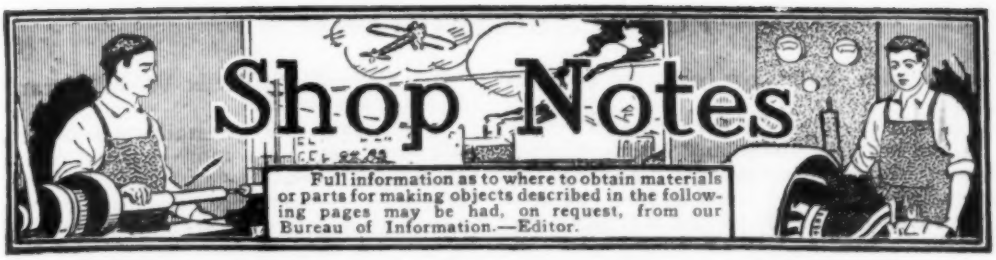
Yea, though ye dreamed a thousand
dreams, I were part of all of these;
For I am the bridge that spans your streams,
and the ship that rides your seas.
I am the heart of your mighty mills, and
the rail that your hands have laid,
Where the pulse of the drills has pierced
the hills, to follow the path I made.

I am the spike that holds the rail, and I
am the engine it bears,
And I am the coach that carries the mail;
my sinew and strength are theirs.
I bear the fruits of your handiwork to
lands you shall never know,
And I am the motor that cleaves its way
where never a rail may go.

I am the clipper that shears the sheep,
and the shoe on the horse's hoof;
I am the hinge, and I am the hasp, and
the rivet upon the roof.
I am the loom that weaves the wool, and
the needle that fashions it then;
I am the mill that grinds the grain for
the mouths of the nations' men.

I am the compass that points your path
when the night is black with storm;
I am the trap that snared the wolf whose
fur shall keep you warm.
I am the pick that mines your coal, and
I am the crane that lifts;
I am the rotary plow that drives a road
through the wintry drifts.

I am the bullet that bores your flesh, and
the probe that the surgeons wield;
I am the helmet, and I am the shell that
shrieks o'er the battle field.
For whether in peace or whether in war,
I serve who slays or saves;
I am the sword that spills your gore, and
the spade that digs your graves.


Shop Notes
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

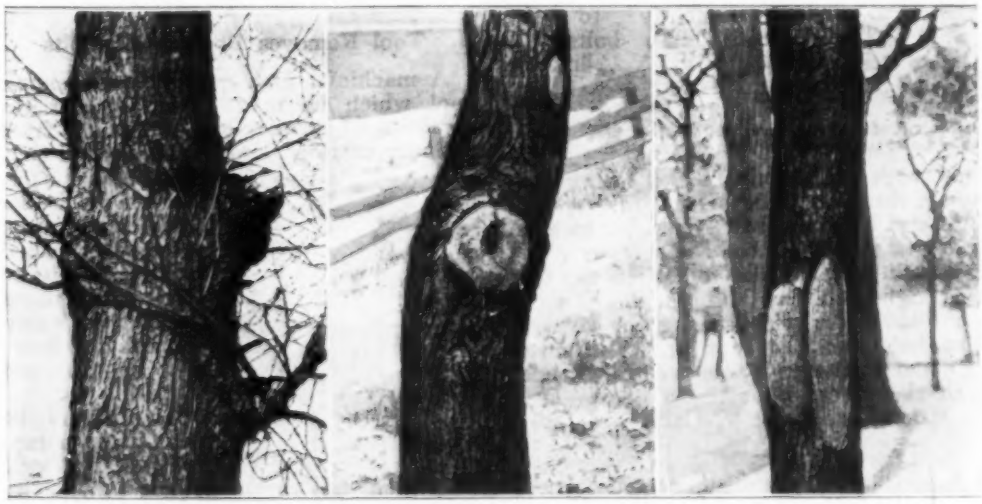
The Care of Bark Wounds in Trees

By C. L. MELLER

BARK wounds endanger the life of a tree more than most persons realize. This is due to the fact that all the nourishment the tree receives is carried in the thin green layer just under the bark. When the bark is injured, the flow of the sap in the green, or cambium, layer is stopped, and the tree fails to receive the proper nourishment. Bark wounds may be of many kinds, but among the most serious are those caused by cutting off limbs improperly.

In removing a limb, the cut must be made as close to the trunk or branch from which the limb grows as is possible. If the work is done so that a stub remains, it is impossible for the bark to grow over the cut end. The stub then dies and the decay is carried into the trunk or branch itself. By cutting the limb off close to the trunk, the new bark, with the cambium layer underneath, gradually grows inward over the cut part, in a narrowing circle, until the wound is completely covered with bark, and thus protected. For added protection, while the healing process is going on, the exposed wood should be given a heavy coat of good paint. This should be repeated as often as necessary, until the wood has entirely healed. When this is properly done, healed wounds are difficult to detect.

Many wounds are caused by horses rubbing against trees used as hitching posts. Others are caused by sharp objects tearing off pieces of the bark. When neglected, these wounds permit decay as readily as do those caused by cutting off limbs in the wrong way. All loose or torn bark should be removed from such wounds, and the exposed wood given as smooth a surface as possible; also, the sound bark surrounding the exposed wood should be cut so that it has a continuous smooth edge. The outline of the area cut away should never be square, but should come gradually to a point at the top and bottom of the wound. Cutting the bark in this way allows the sap to flow freely around the wound and thus



Stubs, Like Those in the Photograph at the Left, Prevent the Bark from Growing over the Wound and Healing It, As It is Doing in the Center Picture. The Bark Wound at the Right is Healing Properly, and in a Few Years will Be Hardly Noticeable

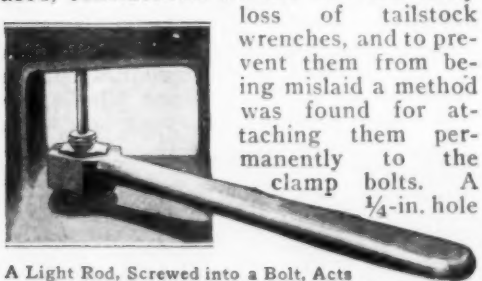
easily nourish the new bark that is forming.

Water must not be permitted to gather in the wound, under any circumstances, as it always hastens the decay of the remaining wood. A small groove cut into the lower end of the wound will allow the water to trickle away as rapidly as it collects. To protect the exposed surface better, it should be given a good coat of white lead or other available paint. One coat will not last all the years it takes for such a wound to heal; the wound should be given a new coat of paint whenever the previous one is worn out.

Properly treated, bark wounds will not seriously endanger the life of a tree. Repairing damages after the wood has had a chance to decay deeply is a very different matter. The same principle of removing all injured or decayed wood and bark, and preparing the surface to exclude water and to permit rapid growth of new bark, applies to the advanced condition. The photographs show bark wounds in various stages of healing, also stubs of limbs which were not cut off properly.

Preventing Loss of Tailstock Wrenches

In a shop where several lathes were used, considerable trouble was caused by loss of tailstock wrenches, and to prevent them from being mislaid a method was found for attaching them permanently to the clamp bolts. A ¼-in. hole



A Light Rod, Screwed into a Bolt, Acts as a Lock to Prevent a Wrench from being Mislaid

was tapped in the upper end of the bolt, and a threaded piece of rod was screwed into the hole, the rod being cut to such a length that it cleared the surface of the tailstock barrel at the top when the bolt was tightened, but did not leave sufficient space for withdrawing the wrench. The bolt could, of course, be removed as usual whenever it was necessary to detach the tailstock or the wrench.—Fred D. Hood, Los Angeles, Calif.

¶A discarded piece of cotton-covered fire hose, collapsed, makes a good machine belt. It stretches a little at first, but runs very smoothly.

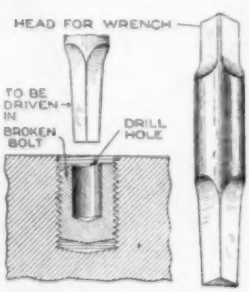
Dry Cells Work Better When Warm

It is a fact, not generally appreciated, that dry cells give more current when warm than when they are cold. For this reason, it is not wise, nor fair to the manufacturer, to test at once a dry cell from a lot shipped in a barrel, and just received from transit in a cold freight car. Before such cells are tested, they should be allowed to remain in a moderately warm room for from 24 to 48 hours, so that their temperature may become approximately 70° F. It requires a considerable time for the cells at the center of the barrel to reach the temperature of the surrounding air.

A cell which will, on short circuit, at a temperature of 80° F., produce a current of 30 amperes, will produce approximately the following currents at other temperatures: zero, 10 amperes; 40°, 20 amperes; 60°, 25 amperes; 100°, 35 amperes. The decrease in current output at lower temperatures does not permanently injure the cell, because such a cell, when raised to normal temperature, will deliver its normal current output. On the other hand, dry cells should not be stored in hot places, because the heat dries them out, and hence decreases their output prematurely. It is, therefore, the better practice to store the cells in cold rooms, but to permit them to remain in a reasonably warm room for a number of hours before they are tested for current output.—George W. Wesley, St. Louis, Missouri.

Tool Removes Broken-Off Bolts

A machinist in a garage has a simple tool which he made especially for the removal of broken-off bolt ends from cylinder castings, and other parts of cars. With this tool, the work is accomplished more effectively and rapidly than by the common method of using a punch and hammer, or the tang of a file.



The tool is made from a tap, the threaded end of which has been broken off. The square head for the wrench is left on, but the opposite end is ground on the emery wheel to a triangular section, with

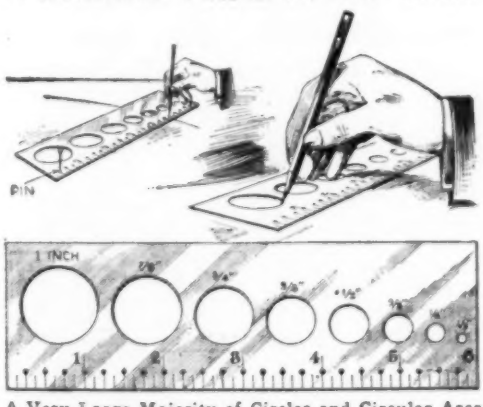
sharp edges. This end is given a slight taper, and is made of such size that when it is driven into a 3/16-in. hole it takes a firm grip. Any broken-off bolt, from 5/16 in. up to, say, 5/8 in., can be removed by drilling a 3/16-in. hole in the center, driving in this tool, and screwing the bolt out with a taper wrench. It is not difficult to make the tool in several sizes, which will have the necessary strength to handle all screws and bolts ordinarily used.—G. A. Luers, Washington, D. C.

Padded Tray for Collecting Eggs

Collecting eggs with an ordinary pail is expensive, as several are likely to be broken on each trip; and where a large number of hens are kept, it is good policy to make a special carrier, furnished with one of the rectangular spacers that are used on egg crates. A padded bed for each egg is made out of sacking, and, if desired, the carrier can be equipped with special trays, one above the other. The eggs can all be collected on one trip, and there is little danger of breakage.

Rule for Drawing Circles

A rule, such as illustrated, has been found very convenient by one draftsman who has a great many circles to draw. It is a fact that the circles required in ordinary machine drafting are for the most part of certain sizes varying by intervals of 1/8 in. or 1/4 in. Circles from 1/8 in. to 1 in. in diameter are drawn by running the pencil around the inside of one of the circular holes in the rule. Circles

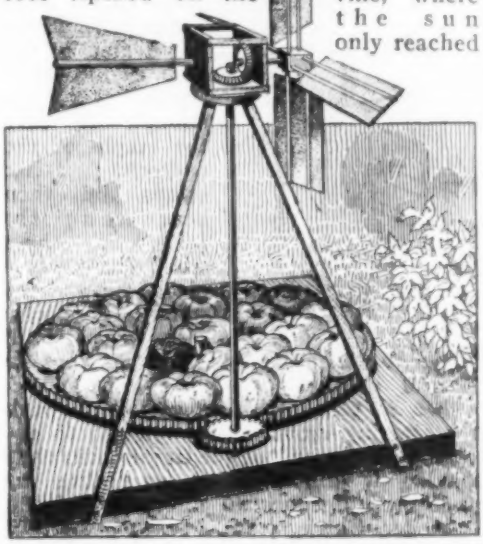


A Very Large Majority of Circles and Circular Arcs in Ordinary Drafting can be Drawn by Means of This Instrument

above 1 in. in diameter are made by the use of holes in the scale, as shown at the left.—Geo. W. Kinzie, Orting, Wash.

Ripen Tomatoes Early by Placing Them on Revolving Table

Tomatoes ripen slowly, unless they get sunshine on all sides; and as the first crops on the market get the best prices, a truck gardener decided not to wait until his tomatoes ripened on the vine, where the sun only reached



A Small Windmill Transmits Power through a Set of Gears to a Turntable Loaded with Tomatoes, Exposing Them to Sunshine on All Sides

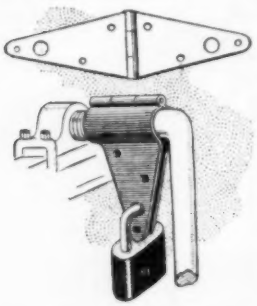
them on one side. Accordingly he gathered half-ripened fruit and laid it, one layer at a time, on a turntable, which exposed all sides to the sun as it revolved. He mounted a light windmill on a plank base, fixed a small bevel gear on the horizontal shaft, and set it in mesh with a bevel gear of the same diameter which turned on a vertical shaft running down to the wooden base, a small spur gear being fastened to the lower end. He then made a turntable by cutting a disk, 2 ft. in diameter, of hard wood, with a compass saw, after which he cut notches in the edge so as to make teeth which would mesh with the spur gear on the vertical shaft. As the spur gear was very small, the gear ratio caused the turntable to revolve very slowly, thus providing the best condition for ripening the tomatoes without unduly taxing the power of the mill.

A table of this kind works excellently with water power, and water-wheel connections are easy to install if a stream runs near the garden; but whatever motive power is used it is necessary to load the table evenly, so that it will balance

well and allow the motor to run without unnecessary handicap.—F. E. Brimmer, Dalton, N. Y.

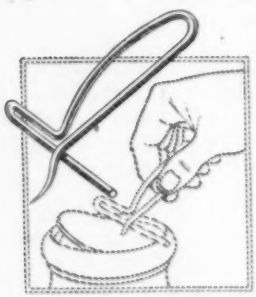
A Lock for Light Autos

A quickly made lock, applicable to certain makes of automobiles, can be constructed from a strap hinge and a good padlock. Holes are drilled in the ends of the hinge straps, large enough to take the staple of the padlock. The straps are then bent near the joint, so that when the hinge is placed around the starting crank, the straps will come together below. The padlock is slipped through the holes and locked. When in place, it is impossible to push the starting crank in far enough to engage with the end of the crankshaft, thus making it impossible to crank the car until the hinge has been removed.—Wm. J. Neiler, Chicago, Ill.



A Milk-Bottle Opener

A handy milk-bottle opener is made from a single piece of stiff wire by bending it as shown in the illustration. One end of the wire forms a fulcrum, on which the handle acts as a lever, forcing the milk-bottle cover up, after it has been pierced by the point at the other end. The pointed end can be twisted around the fulcrum, if the wire is not too stiff, thus making a more rigid tool.—E. K. Wehry, Cedar Rapids, Iowa.

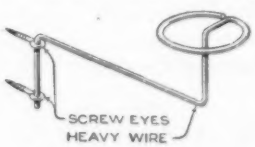


Reversing a Large Flywheel

An engineer, who had been placed in charge of a partly assembled steam plant, found that the flywheel had faced the wrong way when it was bolted in position. The key had not been placed in the keyway, and this could only be accomplished from one side of the wheel. In its present position, however, there was no access to that side of the wheel, and it was therefore necessary to reverse it on the shaft. The wheel was 16 ft. in diameter, cast in two halves, and the lower part was sunk in a narrow pit. Lifting the lower half out of the pit would have entailed so much labor that the engineer used another method. He turned the wheel till the joint between the halves was horizontal, reversed the top half, and bolted it again to the lower half with the wrong ends in contact. He then turned the wheel through a half revolution and repeated the process with the other half.—Jack Solon, Vicksburg, Miss.

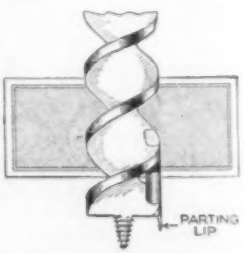
Hook for Ladies' Hats

The size and shape of a lady's hat generally prevent it from being hung securely on an ordinary hat peg, or coat hook, and even if it does not fall off, its delicate fabric is in danger of injury from the sharp metal. The style of hook shown in the sketch meets these objections, and is made by bending a single piece of wire into the desired shape and fastening it to woodwork with two screw eyes. Be careful to make the horizontal part long enough to prevent any part of a large hat from being crushed against the wall.—A. B. Nutting, Boston, Mass.



Removable Parting Lip for Auger Bits

When boring holes in wood with an auger bit, the parting lip of the bit may easily come in contact with a nail in such a way that its shape is ruined. When this happens the bit should not be thrown away as useless, since the lack of one may occasion great inconvenience to a millwright or carpenter who is working on a job located some distance from a supply store.



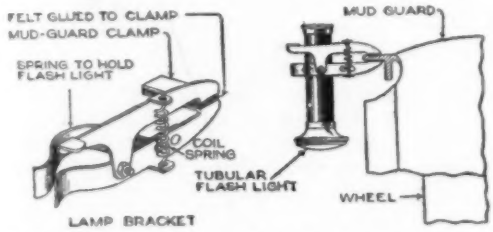
A bit which has suffered in this way may be made to give service indefinitely by the method illustrated. File away both parting lips, and make a hole in one side

of the bit, to take a round pin, in such a way that about four-fifths of the pin's diameter will lie within the bit circle, the remaining portion being filed off after the pin is driven in. The hole for this pin is worked in with a rat-tail file. Suitable taper pins are kept in stock in machinists' supply stores.

When the pin is tightly fitted, it is filed off to the proper shape for a parting lip. Only one lip is necessary, and a bit repaired in this way will give good service. If the new parting lip is damaged, it takes only a few minutes to insert another pin, and file it to shape.—M. E. Duggan, Kenosha, Wis.

Searchlight Clamped for Tire Repairs

For those who prefer the tubular flash light to the trouble light connected to the storage battery, for tire-repair work, a handy device is a sheet-metal clamp which holds the flash light in such a position as to throw the light where it is needed. The idea would be of little use to the driver who always has a companion to hold the light for him in case of trouble, but for those who often drive alone,

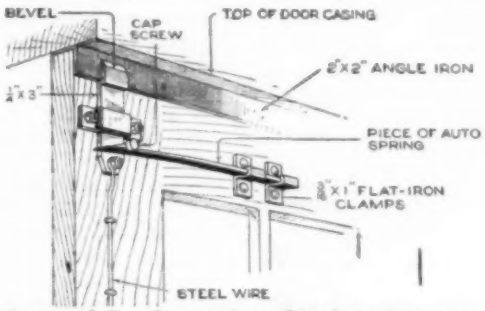


A Flash-Light Clamp Is a Great Comfort to the Lone Night Driver, in Case of Tire Trouble

there is a decided advantage. The metal used should be stiff brass or steel, but the spring which holds the flash light must of course have sufficient springiness for this purpose. The light will be found convenient for tire changing in the position shown, but if some other angle is preferred, the clamp can readily be made to give it.—P. P. Avery, Garfield, N. J.

A Substantial Garage-Door Latch

It is a good idea to provide a large garage door with a good, heavy latch, put on in such a way that it will last for many years and will resist the efforts of thieves. The latch illustrated has been used with satisfaction, and requires no materials for its construction except some scraps of bar iron, a few bolts or cap screws, some steel wire, and a leaf from an old automobile spring. It is, however, well to get a piece of 2-in. angle iron, to

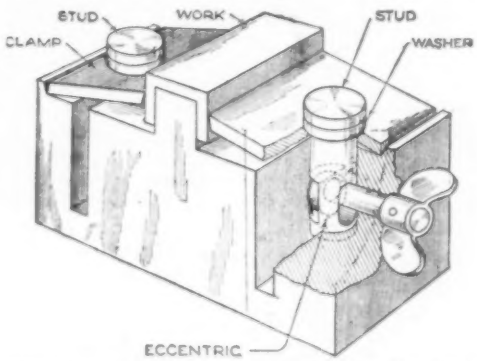


Scraps of Bar Iron and an Old Auto Spring are Made into an Unusually Durable Garage-Door Latch

use as illustrated, as this adds much to the security against theft. A coat of black paint will improve the looks of the metal parts, and enough play should be left so that the paint will not interfere with their free working.

Jig Has Quick-Clamping Motion

The jig shown in the drawing embodies an interesting quick-clamping moti[on]. The work for which it was to be used [was] previously finished to a quite un[iform] width, so that only a very slight motion of the jig clamps was necessary to tighten or loosen the work in the jig. This motion was provided by the use of a small shaft, with two eccentric cams and a wing nut all keyed to it. The eccentrics work in a space hollowed out in the studs, forcing them up or down as the cam shaft is

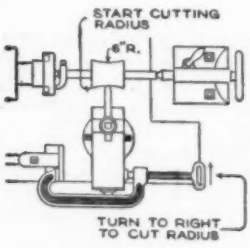


Two Cams, Mounted on a Shaft, Force the Studs Up or Down, and Tighten or Loosen the Work in the Jig

rotated by means of the wing nut. Thus, one-half turn of the wing nut or less will tighten or loosen the work in the jig.

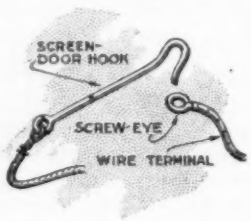
Feed for Radius Work in Lathe

A simple mechanism for feeding the tool, when a double-curved surface must be machined in the lathe, is shown in the diagram. The work is mounted on an arbor as usual, and the tool is set exactly at the level of the center of the work. The tool post is clamped down only moderately tight, and a large C-clamp grips the rear of the tool holder, as shown. Where a spherical surface is to be cut, use a long tool which has its cutting edge on the farther side of the spindle, and run the lathe backward.



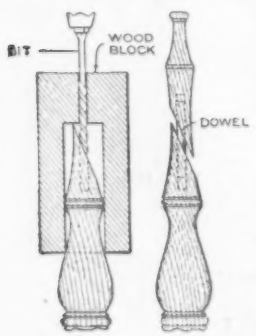
Screen-Door Hook Forms Switch

For battery circuits carrying currents at low voltage, as used by experimenters, an ordinary screen-door hook forms a quite satisfactory switch.



Repairing a Crippled Table Leg

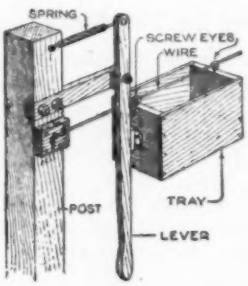
When a round leg of a fancy table, or chair, gets broken, it usually breaks on an angle, and cannot be glued properly unless a dowel is inserted. Many persons balk at inserting such a dowel so it brings both pieces together evenly, but the following is a simple way of doing it.



In a piece of wood, 3 in. square and 8 or 10 in. long, bore a hole in the end just large enough to take the leg, and about 6 in. deep. Remove the bit, and in the same hole continue through with a bit the size of the dowel wood (about ¼ in.). Insert the broken leg; if tapered, wind string around the narrow part to build it up to the diameter of the hole. Then insert the bit from the other end, and the block will guide the bit so that it bores a hole squarely in the center. The illustration shows the arrangement. Then bore the other part of the leg, insert the dowel, and glue. The two parts should fit exactly and be quite strong. This can also be done with square legs.—V. H. Todd, Rainbow Lake, N. Y.

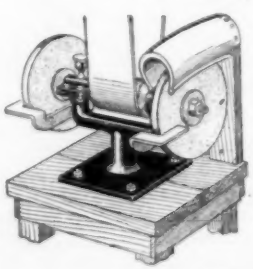
Message or Small-Tool Carrier for the Shop

The drawing shows a handy spring-actuated device for carrying messages, small tools, or any light articles from the shop, office, or storeroom, to other parts of the building on the same floor. A small box has screw eyes in the upper edges, by which it is hung from the wire. This wire may be stretched between any two convenient points, and should be very tight, so as not to sag. An arm on the post or wall to which the wire is fastened, supports a wooden lever. A spring, such as used to hold screen doors shut, is attached to the upper end of the lever, and to the post. To send the carrier to the other end of the line, pull back the lower end of the lever, draw the box up snug against the lever, and let go. If the carrier is to be used for papers or other light articles, the box should be provided with a cover.—J. Horace Van Nice, Waukon, Iowa.



Tire Casing Forms Guard for Emery Wheel

Making a guard out of sheet iron to fit an emery wheel entails considerable labor, but an old piece of tire casing needs very little alteration in order to give it the right curve.



¶For chipping off marble, a wood rasp or coarse file has been found useful.

A Successful Homemade Farm Tractor

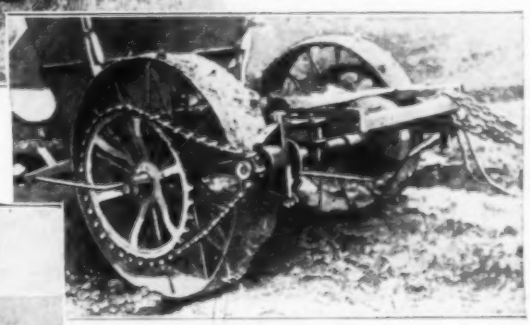
By THOMAS A. LEADLEY

AT an expense of approximately $18 for materials and labor, a Nebraska farmer converted into a tractor a second-hand automobile that had outlived its usefulness as a pleasure car, and for which he paid $125. The tractor pulls a gang plow easily at a depth of 5 in.; in a full day's time it will plow eight acres with a fuel consumption of 1½ gal. of gasoline per acre and 1 gal. of oil a day. The extra equipment used in making this homemade outfit consisted of two small sprocket wheels; a heavy steel shaft, or axle, and two clamps for bolting it to the frame; steel braces; two grain-binder drivewheels with large sprocket wheels attached; two drive chains, and a few bolts, keys, etc. Most of these parts can be found in the junk pile on the average farm.

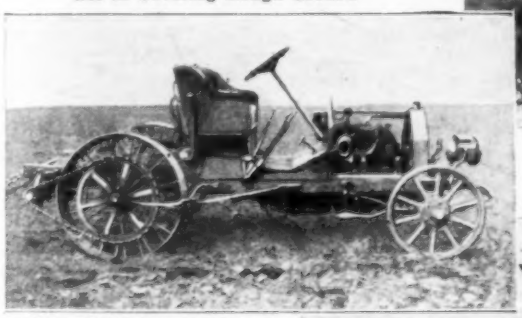
The converted machine works on the same principle as the tractor attachments for automobiles now on the market, but is much less expensive, and therefore is more likely to appeal to the man with the old automobile that may not be thought worth the price of the manufactured tractor attachment. Many automobiles, which have some parts that are worn too badly to stand up under road driving, might be suitable for converting into tractors of this type, in which a good engine and bearings and a stout frame are the principal essentials. In fact, the first cost of the automobile was really a great deal less than $125, for it was equipped with four tires, two of which were almost new. These were valued at about $75, and were transferred to another automobile that the farmer already owned. So, in fact, a machine costing about $70, or less than the price of one good horse, was capable of doing the work of four or five.

The work of converting the old automobile into a tractor was very simple, and could be accomplished easily by any-

Although Having an Appearance Very Similar to an Ordinary Old-Fashioned Automobile, the Machine Has the True Tractor Characteristics of Heavy Pulling Power and Hill-Climbing Ability, Together with Considerable Possibilities in Covering Rough Ground

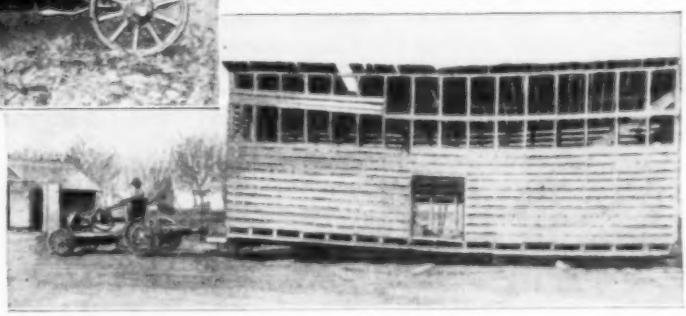


The Rear-Axle Shaft of the Car Serves as a Jackshaft, from Which Power Is Transmitted by a Chain to the Large Binder Wheels



PHOTOS BY COURTESY OF ALFRED NOWKA

Above Is a Photograph Which Shows the Braces Built onto the Ends of the Rear Wheels. To the Right, the Tractor is Shown Hauling a 32-Foot Corn Crib to a New Position. This Somewhat Unusual Task was Performed with Entire Satisfaction, and without Injury to the Mechanism of the Tractor



one with the aid of a blacksmith. The two rear wheels were first removed, and the tires were taken off the front ones. On each end of the rear axle a small sprocket wheel was fastened by means of a key. The axle being of the full-floating type, the roller bearings inside the wheel housing were left in. The rear springs were then removed, and the axle was clamped firmly to the frame of the car.

A short distance in front of the rear axle, the heavy steel shaft was bolted securely to the frame, on each side; and on the ends of this shaft were keyed the two binder drivewheels, with sprocket wheels attached. The ends of the shaft were braced to the frame in front with additional steel rods, as the illustrations show. Ordinary binder drive chains were used to connect the sprocket wheels on the rear axle to the large ones of the drivewheels. The fenders and all other unnecessary equipment were removed, and the conversion of the automobile into the homemade tractor was complete. No additional gears were needed, the same differential was used, and all that remained to do was to hitch on the load.

The sprocket wheels gave a gear ratio of 6½ to 1; that is, the sprockets on the rear axle made 6½ revolutions to 1 revolution of the drivewheels. The machine is operated in the field on high gear, or direct drive. At first, larger sprockets were used on the rear axle, and the machine was driven on the intermediate gear, but this method did not prove very successful, so the smaller sprocket wheels were substituted. These are 4 in. in diameter and have five teeth. The sprockets on the drivewheels are 26 in. in diameter and have 33 teeth.

With this gear ratio, the machine moves at the rate of three miles an hour, pulling with ease a gang plow in the field, without running the engine extremely fast or slow. The gang plow is attached to the frame of the tractor in the rear. The absence of the rear springs makes the machine ride somewhat roughly, but springs of some kind could readily be put on to absorb some of the jar, and to lessen the strain on the gearing and frame.

Besides plowing 50 acres up to date, the tractor has pulled a three-section harrow over some of the plowed ground, which shows that the machine will do work on soft ground. It was also used to move a chicken house a distance of one-fourth mile. The building was dragged on the ground, and most of the distance was covered with the machine traveling on high gear. The ground was wet in places, and when such a condition was encountered, it was necessary to shift to low gear. On another occasion, a corn-crib was moved with the tractor, as the illustration shows. The crib was 32 by 10 ft. in dimensions, and was mounted on wheels. It was pulled a distance of 200 yd. The owner of the machine intends to use it also for pulling a grain binder in the harvest field.

Apparently there has been no excessive wear on the bearings and gears, and no trouble has been experienced with the motor, which is a four-cylinder one. One headlight was allowed to remain on the car, and was of use occasionally for late or early plowing. Extra lugs or spikes were bolted to the drivewheels on the outer surface, to give them more traction. The machine thus equipped weighed 2,234 pounds.

While it would not be possible in every case to buy a used motor car as cheaply as in this case, or to get one in as good condition, yet there are many times when used cars can be bought for a small figure and made use of, or when one that is about to be disposed of might be converted into something more useful on the farm. The number of old automobiles increases each year, and a general application of the method followed would help to reduce the number of cars that annually go to the junk pile.

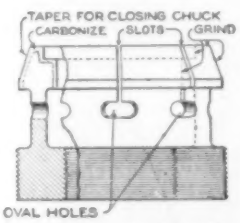
Removing Dents from Auto Bodies and Fenders

If sufficient care is exercised, it is possible to make a good repair job of the dents and disfiguring depressions which mar the surfaces of automobile bodies and fenders. Fill a sack made of heavy canvas with builders' sand, and fasten a board to one side of it, so that one side of the bag is soft and one rigid. Place the soft side against the cavity in the sheet metal, and hammer the ridge which corresponds to the cavity on the other side of the metal. Use a rubber-faced or boxwood mallet, to avoid cracking the material, and strike light blows in circles around the damaged part, narrowing the circles gradually until the center is reached. In this way the material will be restored to its original shape, and if the blows are not too violent, there is

no danger of making a bulge in the opposite direction, as the sand offers sufficient resistance to keep the surface flat. The method of holding the sack in position will depend on the conditions governing each case, but if the car is placed near a wall, the matter will not be difficult.

Cutting Slots in a Chuck after Hardening

The special chuck shown in the cut was required for holding a job in the turret lathe. It has eight jaws, separated by slots about ⅛ in. wide; these slots end in oval holes, which give spring to the jaws. The surfaces marked "grind" were required to be hardened and ground before the eight slots were cut. This was to insure great accuracy, as the work to be held in the chuck was previously finished on the outside, and only .015 in. was allowed for clamping. The problem of cutting these slots after the work had been hardened was a somewhat unusual one, and was solved as follows:



A piece of .40-per-cent carbon steel was used, and was finished all over, as shown in the sketch, except that the slots were not cut, and about .020 in. was allowed on all surfaces to be ground. The oval holes were cut as shown. The piece was then carbonized, as is done in case-hardening, to a depth of about 1/16 in., but instead of being hardened, was cooled slowly to leave it soft. During this process, the threads were protected with fire clay. The slots were then cut to a depth of only 3/32 in. below the surface, so that the jaws were still connected with each other by solid metal. This connecting portion was, however, entirely below the carbonized layer, so that, when the piece was now heated and cooled suddenly, it did not harden as did the carbonized part on the outside.

The proper surfaces were ground to finish, and the slots were cut apart in the milling machine. The other member of the clutch, which has an internal taper fitting against the tapered surface shown, is omitted from the drawing for the sake of clearness. It screws onto the outside threads, shown below, while the inside threads fit the spindle of the lathe.—S. B. Royal, Baltimore, Md.

A Simple Potato Planter

The owner of a kitchen garden avoided the expense of purchasing a potato

Four Pieces of Wood Make an Inexpensive Potato Planter Which Gives Good Service in the Hardest Soil

planter by making a very serviceable one out of two pieces of wood connected by strips, or crosspieces, of the same material. The illustration shows how the potato is held in the planter, and dropped into position by separating the jaws. The crosspieces should be made strong, so that foot pressure may be applied to force the points of the tool into the ground.

Wick Waters Seedlings

In dry weather, young seedling plants may wilt for lack of water. Yet it is a difficult matter to supply them with moisture in the ordinary way, since the sun dries the water up very quickly. By placing a tub, or pail, full of water at each end of the row, with a wick of soft

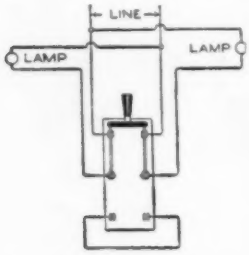
A Length of Cotton Wick Provides an Irrigation System to Supply Young Plants with Water

cotton, or other absorbent material, between them, and lying along the ground at the side of the plant stems, they will receive sufficient moisture with a minimum of attention.—S. Leonard Bastin, Bournemouth, Eng.

¶A cheap glass cutter, dipped in kerosene, does straight work on all but very heavy glass, with satisfactory results.

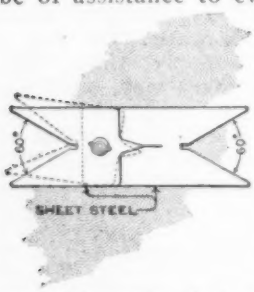
Series-Parallel Switching for House Lights

The method of dimming electric lamps by connecting them in series instead of in parallel has been widely used on automobiles, but it has also interesting possibilities in house lighting. The diagram shows how an ordinary double-pole, double-throw switch can be connected to two lamps in such a way that, when the switch is thrown to the upper position, the lamps are in parallel as usual, while, with the switch in the lower position, they are in series across the line. It must be understood that lamps burning on half voltage, as these are when connected in series, burn with a very low efficiency, but for occasions when but little light is required, this may not be a great objection. The power used by the two lamps when dimmed will be but little more than one-fourth of what the two use when connected in parallel.—Victor H. Todd, Rainbow Lake, N. Y.



Test Gauge for Lathe Centers

The cut shows a simple tool which will be of assistance to every machinist who works on a lathe. With it the two lathe centers can be tested for correct shape and position at one observation. The tailstock center is brought up to the proper distance, and the gauge is placed with the two 60° angles fitting over the two centers. Like an ordinary center gauge, it shows the correct 60° shape, and at the same time indicates whether the two centers are in line with each other. If the gauge fits them neatly, but the pointer does not rest upon the center line, it will be apparent that there is an angular error in the position of the centers. The gauge should be accurately made of tool steel, tempered and ground. It will also be useful for testing centers in the milling machine or shaper. For resetting the centers accurately after doing taper work, it may give more accurate results than the marking on the tailstock itself.—S. B. Royal, Baltimore, Md.

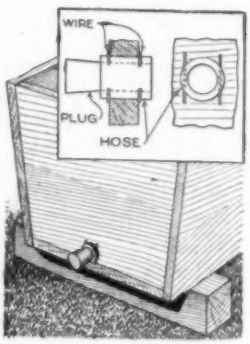


Securing Asbestos Gaskets

A tight joint can be made in the faulty exhaust-pipe coupling of an automobile by placing a gasket of fine brass-wire mesh between the asbestos gaskets. When the flanges are tightly bolted it becomes imbedded in the asbestos, and prevents it from blowing out.—Joseph Magis, Ouffet, Belgium.

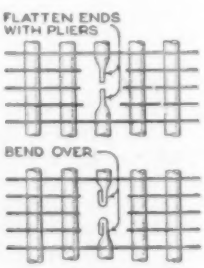
Rubber-Hose Bushing for Plug

When cutting a wooden plug for a barrel or trough, it is not necessary to spend time in shaping it to make a water-tight fit in the vent, if a piece of rubber hose is ready to hand. Thrust the rubber into the vent, allowing it to project about ¼ in. on both sides, and secure it in position with four nails, or short pieces of wire. When the plug is forced into the hole, the pressure of the tapered handle against the rubber causes the latter to expand, and effectually prevents leakage.—C. A. Black, Jr., Hightstown, N. J.



Quick Repair for Auto Radiator

An automobile driver found it necessary to do an emergency repair job on a leaking tubular radiator. As he was far from a garage and had no soldering outfit, he cured the trouble with his pliers and a pair of tinsmith's shears, which he always carried. He cut the leaking tube with the shears and flattened the two broken ends with the pliers, after which he bent the ends over, as shown, and stopped the leak completely.—Harold E. Benson, Boulder, Col.



Taking Panorama Photographs with an Ordinary Camera

With a little care, the amateur photographer can use an ordinary camera to make landscape views of a width extending far beyond the limits of the visual field. It is necessary to use a tripod, as the picture is composed of a series of views taken from the same point, the angle of vision being changed for each picture. Select the landscape to be photographed, and direct the lens to that part of it which is to appear at the right or left extremity of the panorama. Focus for extreme distance, and expose, after which swing the camera to the next portion of the view, and expose again on another section of the film, repeating the process until the whole of the landscape has been photographed. When prints have been made, trim the edges, and paste them edge to edge on a cardboard mount, so that they form a continuous scene. If this is carefully done, the joints will be hardly noticeable, but the result depends to a great extent upon the judgment shown in using the camera. The views should all overlap, and the joints should be made, if possible, along the vertical outlines of objects in the picture, such as trees or telegraph poles, so that the dividing lines will be nearly invisible, or can be made so with light strokes from a lead pencil. It is, of course, important that the degree of development should be uniform in the different views.

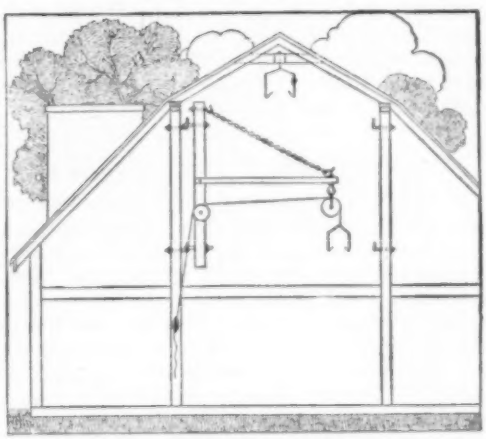
In Joining Prints Together to Get the Panorama Effect, It Is Best to Trim Them along Some Vertical Line in the Photograph

Trough Prevents Grounding of Spark Plugs by Rain

Water leaking through the hinge of the hood cover on an automobile collects in the depressions around the spark plugs and often grounds them. A galvanized-iron trough, hung from the center rod that extends from dash to radiator, will carry off the water as it collects, and thus avoid the trouble. This trough should be sloped from the cowl down toward the front end of the car, the spout being in front and to the left of the engine. Either wire or iron straps may be used to hold the trough in place.—Harvey Mead, Scranton, Pa.

Hay Crane Helps in Utilizing Barn Space

The mechanical fork which runs on a track under the ridgepole of a barn is only partly efficient, according to the experience of most farmers. The center of the mow can be filled with it, but considerable work has to be done by hand in storing the hay at the sides of the barn. To eliminate most of this labor, a farmer made an adjustable crane with fork attachment, of the type shown in the sketch. Hinges of the simplest hook-and-eye construction were made in the farm smithy, the hooks being made permanent fixtures on all the posts standing on both sides of the barn driveway. The crane was then hung to the post nearest to the part which was to be filled, and was afterward moved to the other posts by the fork which ran along the roof. The beam of the crane was made to swing over the mow by the weight of the fork, this condition being effected by adjusting one of the hinges off center, so that the upright member was tilted at a slight angle from the vertical.



An Easily Adjusted Crane Enables a Mechanical Fork to Operate in Every Part of a Haymow

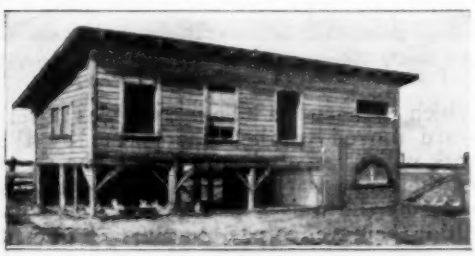
This arrangement also proved advantageous when the barn was being unloaded, as hay is not easily lifted by hand when it has been trampled down solidly in the mow. With the crane, however, it was found possible to move enough feed in 15 minutes to last for several days. —Herbert A. Shearer, Willits, Calif.

Old Newspapers as Kindling Wood

When a number of old newspapers are used to kindle fires it requires considerable time to crumple them, and if they are left folded they do not burn readily. On the other hand, when crumpled they sometimes burn too quickly. A convenient, quick way, when the newspapers are desired to take the place of kindling wood, is to lay eight or ten single sheets of newspaper, one upon the other, and roll them up in a slender tube, then flatten the tube out and bend it under the fingers, so that a single knot can be tied with it. Pull the knot tight; five or six of these knots laid in the stove grate will ignite the coal as well as wood kindling.

Poultry Houses on Posts Save Space

Visiting a city back-yard poultry keeper, the writer was surprised to discover that his flock numbered 600 head. His lot was of liberal size, but that was not the explanation, because, ordinarily, it would have seemed a small place for 175 hens. His simple device was the building of poultry houses on posts. The runway of each house was the space beneath it, effecting a striking and obvious economy. The enthusiastic owner told of other advantages. The post feature reduced the outlay for chicken wire; it created an exceptionally dry and healthful pen, and it minimized the rat danger.



Poultry Houses, Placed on Posts above the Runway, Economize Space and Provide a Dry Floor for the Fowls

The principle is adaptable to most styles of poultry houses. A lifted trapdoor in the pen floor gives the hens access to an inclined board, on which cleats are nailed, extending to the ground below. This space is inclosed on two sides with ordinary poultry wire. In the back it is boarded up for protection against wind. Here a door is installed for convenience in removing contaminated surface soil, and substituting fresh material.

It will pay many poultry keepers to elevate their chicken houses on posts. In doing this, one of the main things is to obtain an absolutely tight floor. A double floor, or a floor of matched material, is advisable. A cartload of dry sand spread over the bare floor, then liberal use of shavings, straw, or other good litter material, makes the floor draft-proof and sanitary. The sand should be removed twice a year, and will be found valuable for fertilizer.

To the poultry keeper whose premises are not well-drained, so that at rainy periods water accumulates, the poultry house on posts should make special appeal. Thousands of back-yard flocks are unprofitable because their quarters are damp. Under such conditions, the house on posts should be considered well-nigh indispensable. In some of the commercial poultry districts of the Pacific coast it is employed successfully for this reason.

On the score of appearance, no one could possibly object to the poultry house on posts. With the ordinary back-yard flock, the most unsightly feature is the runway. It can be placed in a subordinate position beneath the chicken house with undeniable profit.—J. T. Bartlett, Ft. Collins, Col.

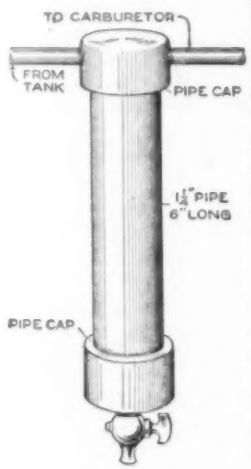
Fruit Keeps Better When Carefully Picked and Packed

A certain proportion of the fruit harvest is worthless before it reaches the market, but the proportion is being reduced every year through the efforts of experts. Two causes are given for nearly all the waste that occurs. One is carelessness in handling the fruit, and the other is neglect of the precautions necessary to keep it cool after harvesting. The

former must be eliminated during each of the three processes through which the crop goes before shipment—picking, grading, and handling. Any injury to the skin of the fruit is likely to cause decay; and to reduce wastage, fruit growers continue to improve the equipment used in these processes. Where fruit is grown on a small scale, it is not possible to make radical changes in organization and material, but considerable saving is insured by increasing the supply of grading tables and picking baskets, and by using care in the selection of trays, crates, boxes, and containers. To keep the crop cool until shipment, special cellars and storerooms are advised, and some provision can be made against transportation risks if the shipper gives personal attention to the condition of the refrigerator cars that are to haul his crop.—F. H. Sweet, Waynesboro, Va.

Dirt Trap for Gasoline Line in Boat Engines

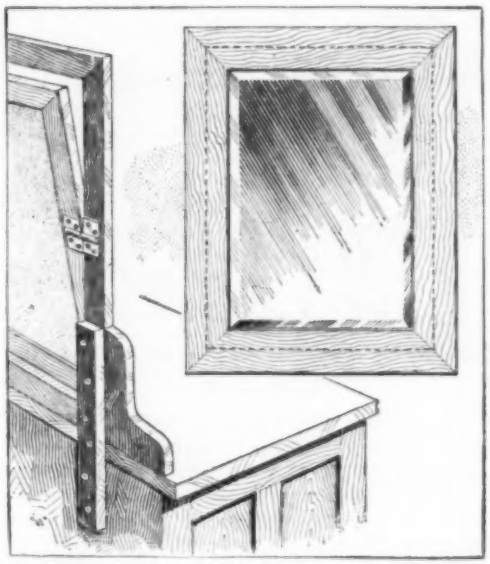
The owner of a motorboat experienced a good deal of trouble through the accumulation of sediment in his gasoline tank, and to prevent the frequent choking of the needle valve in the carburetor, and also to prevent flooding, he installed a trap in the feed line between the carburetor and tank. It consisted of a wrought-iron pipe, with a cap at the upper and lower ends, the upper one being drilled and tapped to take the feed pipe on both sides. The lower cap was tapped to take a ¼-in. petcock, with which the trap was carefully drained before making a trip. No screen was used, as the engine was only of moderate size, so that the flow of fuel was slow enough to permit dirt and water to sink into the well between the separated ends of the feed pipe.—Wm. F. Crowell, Providence, Rhode Island.



¶When no other supply is available, resin taken from knots in pine boards may be used in soldering a tin roof.

Changing a Rigid-Frame Mirror to a Tilting-Frame Type

A plain mirror was converted, by the addition of two friction hinges, into a tilting mirror, which was mounted on a low dresser, thus forming a much more useful article of furniture. By means of a gimlet and a keyhole saw, the cuts were completed through all four sides of the mirror frame; the inner part containing the mirror was then removed, and the sawed edges dressed and varnished. The friction hinges, which were obtained for a few cents from an upholstery store, were mounted behind as shown. Two pieces of hard wo d were shaped to form the curved brackets at the sides, and upright cleats were fastened securely with screws to the back of the mirror and the dresser. The cleats held the mirror in place, the curved pieces being merely for ornament.—W. B. Gray, Louisville, Ky.



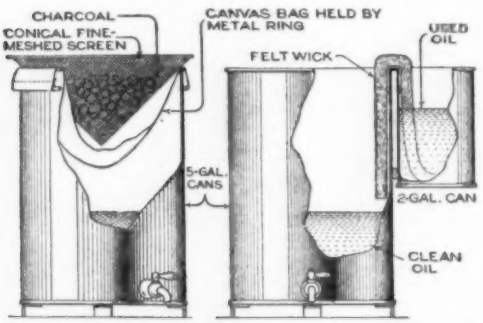
By Sawing through All Four Sides of Its Frame and Mounting Friction Hinges, a Straight Mirror was Converted into a Tilting One

Horse Muzzle for Hanging Basket

A hanging basket for flowers may be quickly made by adding a handle, made of three wires meeting at a hook, to an ordinary horse muzzle. The basket is lined with moss, dirt put in, and the flowers planted. It is then ready to hang, and makes as neat an appearance as a manufactured basket.—Chas. A. Black, Jr., Hightstown, N. J.

Oil Filters for Garage Use

It is well known that smooth operation and long life of automobile-type engines are promoted by draining the crank case at regular intervals and renewing the oil. If the old oil is thrown away, however, it



Filtering the Oil Which has been Removed from the Auto-Engine Crank Case Makes It Almost as Good as New

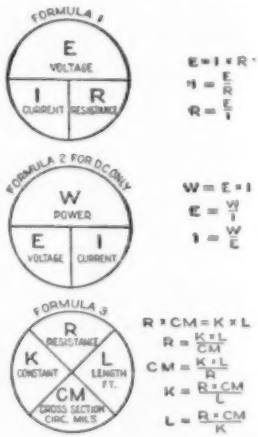
represents a considerable waste. Filtering this oil for the removal of particles of grit, metal, and carbon is a practical process which can be accomplished without any expensive apparatus. Two methods are illustrated, these having been selected from several which were found in use in large auto-repair shops.

The method shown at the left is used in quite a large shop, where a dozen cars are drained daily, making the item of oil saving one of considerable importance. The apparatus consists of a cone-shaped canvas bag, supported by a metal ring thrown over the top of a 5-gal. can. Inside of the canvas, separated from it a distance of about 1 in., a fine wire-mesh screen of similar shape is used as a container for broken charcoal, such as is sold for use in kitchen ranges. Filtration by this means is rapid, being about 2 or 3 gal. each hour. The charcoal acts as an absorbent, gathering the grit, wax, and dirt from the oil, and the wire mesh and canvas also assist by catching certain kinds of dirt which do not adhere to the charcoal. The filter is emptied every other day, and washed out in gasoline.

The second type of filter is even less expensive, though the operation is very slow. One large can, of 5-gal. capacity, receives the oil after it has been filtered by working through the felt wick leading from a smaller can, attached in the position shown. The felt wick is made up of several long strips of felt, such as used for gaskets around crank cases and the transmission. The wick should dip some distance into the used oil, but the other end should hang down so as to reach a lower level than the bottom of the small can. The oil works up into the wick by capillary attraction, leaving the dirt behind. Gradually, it soaks through the other end of the wick, where it gathers into drops and falls to the bottom of the large can. After as much oil has filtered from the small can as will separate itself from the dirt, the remainder is thrown out, and the can is cleaned with gasoline ready for filtering a new lot of oil. It is necessary occasionally to immerse the wick in gasoline for cleaning, or to substitute a new wick.

Diagram Facilitates Remembering Electrical Formulas

Formulas which an electrician has to use very frequently in his work can be written in a form which makes them much easier to remember than the ordinary mathematical expressions. Three of these formulas are shown in the diagram, expressed in the usual ways at the right, and embodied at the left in the circular form. The principle of these circles is that the product is balanced or set against its factors. In the first formula E is the product, and I and R are the two factors. By dividing the product by either factor, the other one is obtained. The circle is merely a visual method of remembering this relation. The same holds true, in formula 2, of the power, voltage, and current, W being here the product, and E and I the factors. (It should be noted that formula 2 applies in direct-current work only.) Formula 3 refers to the resistance of a piece of wire in relation to its dimensions. The ordinary form of this formula is the second equation given, and means that the resistance of a piece of wire is equal to the length in feet multiplied by a certain constant number, K, divided by the area of the cross section, which is expressed in circular mils, or circles .001 in. in diameter. In this case,



R multiplied by CM is equal to K multiplied by L; that is, the products of each pair of factors opposite each other are equal. Any of the four factors may be found by multiplying together the two to the right and left of it, and dividing the result by the one opposite. Thus, if the relation of these four symbols in the diagram can be fixed in the mind, it is not necessary to remember any of the formulas themselves. The number K is the resistance of a wire 1 ft. long and .001 in. in diameter, as given in electrical handbooks; for soft copper, it is about 9.6.—Geo. W. Lord, Philadelphia, Pa.

Mud Hook for Auto Trucks

A lumber dealer, who used motor trucks to haul his loads, found that nonskid chains and traction lugs were sometimes insufficient to extricate a mired truck. For such cases he used a block of wood, which he attached to the felloe of the wheel by means of a chain, eyebolt, and hook. Only one block is needed on each driving wheel. If one is particular about the appearance of his car, a piece of rubber hose may be used on the chain to protect the finish on the felloe and spokes.—Stanley R. Booth, Sistersville, W. Va.

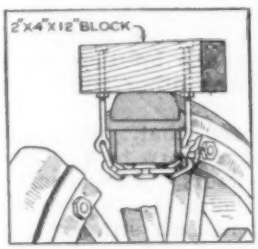
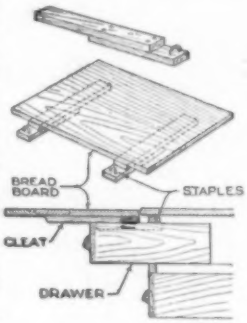


Table Supported on Open Drawer

In a very small apartment kitchenette, the occupant contrived to save space by arranging a little breakfast table, consisting of a device to fit into an opened drawer, as shown. The drawer was opened far enough so the cleats fitted in them, the staples hooking under the face board over the drawer. The drawer was pushed in far enough to touch the outer end of the bottom cleat. One pair of cleats was placed in each side of the drawer. A common bread board was then laid across the cleats, and the result was an excellent table for a light breakfast, or some extra table space for doing the kitchen work. There is nothing to prevent fastening the board permanently to the cleats, as the whole can then be removed upon pulling out the drawer slightly.—L. B. Robbins, Harwich, Mass.



Wiring Insulators from Inner Tubes

The electric wiring on a car body may be insulated when installed by putting pieces cut from old inner tubes under the heads of the double-pointed staples used to hold the wires in place.

Park Entrance Made of Plain Lumber

The gateway here shown was very economically constructed by using lumber supplied in standard dimensions. The uprights are 4 by 4 in.; the lower crosspieces and fence rails, 2 by 4 in., and the fence spindles and upper crosspieces of the gates, 2 by 2 in., as are also the short horizontal strips which extend at right angles between the crosspieces, to support vines over the archways. The arches are made of basswood, which is easily bent into shape after being soaked overnight in water. The structure was painted white, with the exception of the fence spindles, which were given a brown tone; but the color scheme in such a case depends on the surroundings. At very slight expense, a gateway of this kind greatly improves the entrance to a farm, a small park, or even a private residence. The example shown stands at the side entrance to a large park, to serve until the development of the neighborhood will make possible something of a more substantial nature.

By Using Cheap Lumber, an Ornamental Gateway is Erected at the Entrance to an Undeveloped Park, at Trifling Cost

Installing Shop Motors on the Ceiling

By H. T. BOYNTON

THERE are many methods of raising an inverted motor to a location on a ceiling, but the one outlined herein will be found unexcelled under certain conditions. Fig. 1 shows how the tackle is

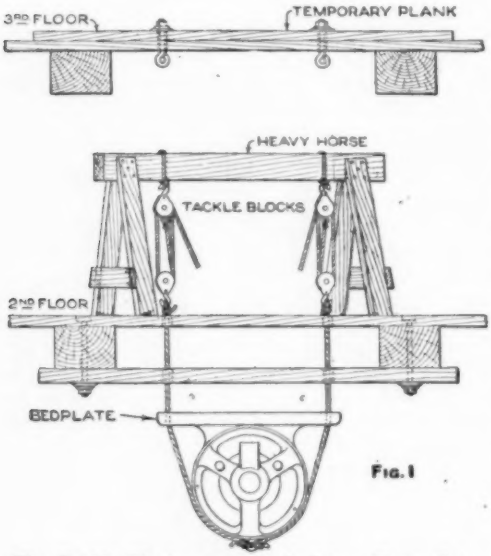


FIG. 1

The Tackle Blocks are Attached to a Horse, Set Diagonally, or, Better in Many Cases, to Eyebolts in the Next Floor Above

arranged, and Fig. 2 gives a plan view at the second floor. The inverted motor is raised with two ropes, each of which passes through a foundation-bolt hole in the bedplate, is arranged around the motor frame, and made fast in the eyebolt at what is normally the top of the motor. The two holes in the bedplate are located at diagonally opposite corners. The hoisting ropes, after being made fast to the motor, are threaded through two of the four holes which have been bored to accommodate the bolts in the stringer pieces which will support the motor. Then the ropes are carried through two accurately located holes in the floor above. On this floor rests a horse supporting the two sets of blocks with which the motor is raised. As indicated in the drawings, the horse is arranged diagonally so that it is directly over the two holes in the floor through which the hoisting ropes pass. Sometimes, instead of using a horse to support the tackle, it is better to arrange temporary eyebolts in the floor of the story next above, as shown at the top of Fig. 1. They can be readily removed after the motor has been raised, but can be quickly relocated when the motor must be replaced or taken down.

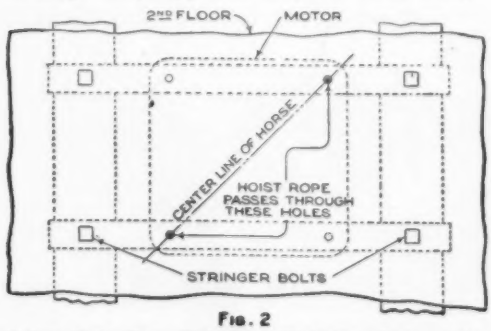


FIG. 2

Using Only Two Holes for Hoisting, Leaves the Other Two for the Bolts to Hold the Motor While the Ropes are Unfastened

After the motor has been raised to its position on the stringer planks, two bolts are inserted through the open holes, and set up tightly. Then the hoisting ropes are pulled out and the other two bolts are inserted.

It should be noted that, with this method, it is not necessary to cut any large holes in the floors. The stringer pieces having been bolted to the beams, the four holes, two in each stringer, for the four motor-supporting bolts, are located and bored in them. These holes should be at least ⅛ in. greater in diameter than the diameter of the supporting bolts. Then the two holes for the ropes are bored through the floor above. If a bit long enough is available, this is easily done by using the holes in the stringers as guides and boring with the lower end of the bit through one of them. If no long bit is at hand, the locations of the floor holes can be accurately determined with a plumb bob, as shown in Fig. 3. The floor holes should be generously large, so that they will not bind the hoisting rope. When buying a motor for inverted ceiling mounting, select one which has a single bedplate, instead of two slide rails, as it is much more difficult and

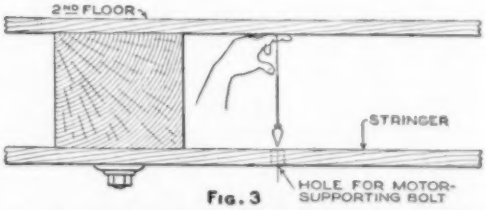


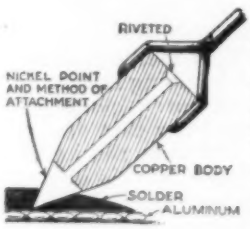
FIG. 3

For Locating the Floor Holes above the Bolt Holes in the Stringers, a Plumb Bob Is Useful

tedious to line up and level two slide rails than one bedplate. Furthermore, the slide rails will require at least twice as many supporting bolts as the bedplate.

Nickel-Pointed Soldering Copper for Aluminum Work

Owing to surface oxidation, it is difficult to make solder adhere to aluminum surfaces, but if the soldering copper is furnished with a nickel tip, the operation can be performed quite successfully.



Place the molten solder on the aluminum surface, apply a small quantity of acid flux, bring the copper to an intense heat, and thrust the tip through the solder. Work the copper back and forth, so that the hard nickel tip will scrape away the oxidized surface, and the solder following in the path of the tool will adhere to the aluminum before the air can strike it and oxidize it afresh. It is important that the surface should be completely covered with solder before the scraping process is begun; otherwise the penetrating air will renew the oxidation.

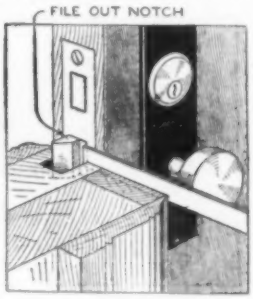
To unite two pieces of aluminum which are already coated with solder, it is only necessary to bring the surfaces together, and to use a little flux and a hot iron. The coating will then fuse without permitting air to penetrate and oxidize the aluminum underneath.—G. A. Luers, Washington, D. C.

Drawing on Glass with Ink

Blueprints from drawings made on glass are more distinct and show greater contrast than those made from tracing cloth. For classified factory records it is, of course, out of the question to use glass, but in special cases, when it is necessary to make very clear prints of small size, a glass drawing is preferable. The surface does not take ink readily, but when treated with a preparation of rosin and turpentine it gives no difficulty. Fill a half-pint bottle with gasoline, break up a 1-in. cube of rosin, and let it dissolve in the bottle. Then paint the surface of the glass with the solution, and when it is dry proceed to make the drawing with ordinary India ink.—William Grinstead, Columbia, Mo.

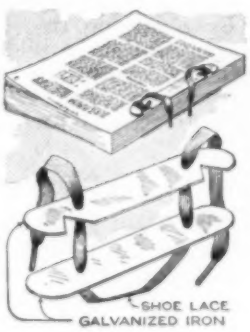
Notching a Lock Makes It Harder to Pick

Some night latch locks are virtually useless for keeping out the skilled burglar, for the reason that such locks can be opened by any skilled lock picker with a putty knife, or any other thin-bladed instrument. About all one has to do to open such a lock is to thrust the blade between the door and the jamb, pushing the latch inward and unlocking the door. But if the latch has been filed, as indicated in the accompanying sketch, the blade cannot reach the beveled portion, and in consequence the door cannot be so easily opened without the key.—J. E. Hogg, Los Angeles, California.



String-and-Metal Paper Clip

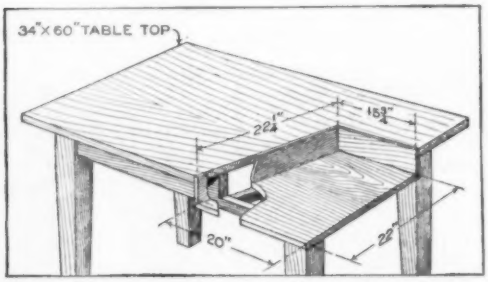
For filing away papers and magazines, a neat and very inexpensive arrangement is made from two strips of galvanized iron and a shoestring. The two strips may be cut out with a pair of snips, and should be about ½ in. wide and 6 in. long. Punch holes ¾ in. from each end, and in one piece cut, or file, V-notches near each end. After a new magazine has been added to the file, pull the string tight, and wind the ends around through the notches in the ends of the upper strip. This will give quite a strong fastening, and it is a matter of only a few seconds to loosen it to add the next magazine.—T. T. Templin, Paris, Ky.



¶ A suitcase is an awkward object to carry on a crowded street. It may be made much easier to handle in a crowd by adding an extra handle placed on one end. This enables the owner to carry the suitcase end up, thus occupying as little room as possible.

Table Desk for Calculating Machines

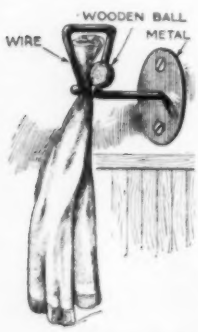
Adding machines are now so generally used in commercial houses that desks constructed to hold them are becoming necessary articles of office furniture. It is possible, however, to use an inexpensive table for the purpose by making a few simple changes. Cut away a portion of the top, as shown in the sketch, and, after removing part of the horizontal frame which supported it, fasten it in position again about 3 in. below its former elevation. In this way the machine can be kept on the operator's right side, with the keys at a convenient level, and the rest of the table can be used for the records in which the totals are being entered. By observing the dimensions, it will be seen that the machine is set at an angle to the edge of the table, so that the keyboard is turned toward the operator.—M. G. Adair, Los Angeles, Calif.



A Simple Carpentering Job Transforms a Cheap Table into a Handy Desk to Hold an Adding Machine

Ball-Clamp Towel Hanger

By using a hanger of the type shown, the danger of tearing a towel is much reduced. It is made with a small metal plate, a piece of 3/16-in. rod, and a wooden ball, with a hole bored in it so that it will slide freely on the wire. Cut a groove in the back of the plate before screwing it to the wall, bend the small portion of the wire that projects on that side, press it down into the groove, and flatten it with a hammer. This will make the wire flush with the plate, and prevent it from turning in the hole.—Violet Johnson, Rockford, Illinois.

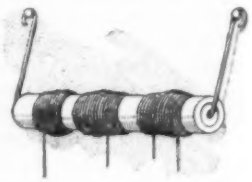


Drilling Drain Holes in Auto Axle

Melted grease which escapes at the end of an automobile-axle housing is likely to fall upon the brake lining, but can be prevented from doing so by drain holes drilled in the housing a short distance from the hub. A ¼-in. hole is about the right size. Jack up the axle about 1 in., and mark the lower surface of the housing with a center punch at the point where the hole is to be drilled, placing a breast drill, pointing upward, on a block beneath it, with the point of the drill in the punch mark. Let the axle down gradually while operating the drill until the hole is made. This method of keeping grease off the brake lining should only be used when no other cure is possible, as there is always a possibility that dust and dirt may find their way into the housing through the hole. Much of this dirt will, however, flow out again when the grease in the housing becomes hot.—Anthony Ottis, Bloomington, Ill.

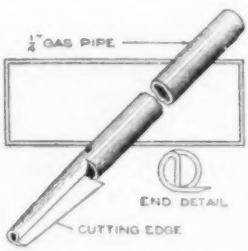
Strings Kept on Old Handle

A handle of this type can be readily used as a holder for pieces of string, these being rolled up on it very quickly.



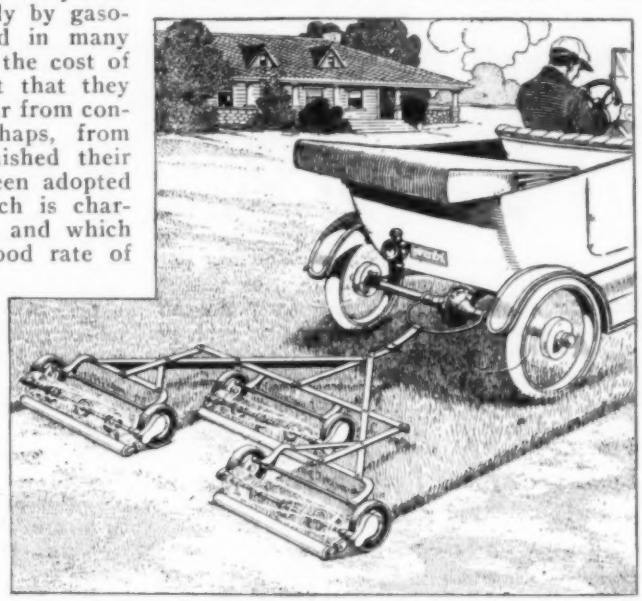
Tool Bores Deep Holes in Wood

When a long hole of large diameter was to be bored in a pattern, the tool illustrated was devised. First, a piece of ¼-in. gas pipe was split down the seam for about 1¼ in.; then one side of the split was bent in toward the center, to remove the chips, the other side being bent out to form a lip to do the cutting. This lip was drawn to a keen edge with a smooth file; it may be casehardened if the tool is to be used often. This makes a very cheap and satisfactory tool; to forge one out complete would be a comparatively expensive and very slow method.—George Ebelhare, Norristown, Pa.



Lawn Mowers Drawn by Light Automobile

The cutting of grass in large parks and private grounds, golf links, and other places where a neat appearance is desired, is a problem for which various solutions have been offered. Specially built power lawn mowers, operated usually by gasoline engines, have been used in many places with good results, but the cost of these machines, and the fact that they are often subject to heavy wear from continual high speed and, perhaps, from faulty springing, have diminished their usefulness. A method has been adopted for use on a golf links which is characterized by great simplicity, and which does the work at a very good rate of speed. Three wide lawn mowers are attached to a steel frame, as illustrated, and the whole is attached to the rear of an ordinary light automobile. The two mowers at the side overlap the central one by a few inches, to insure covering the swath completely. As the automobile did not have to be provided especially for this purpose, but was required for other purposes, for which it could be used when not engaged in drawing the mowers, the first cost of the apparatus is very low, consisting of only three mowers and a few pieces of angle steel. There is nothing to get out of order, beyond the mechanism of the automobile itself, and the mowers require no attention except sharpening and oiling. A swath about 10 ft. wide can be cut. The device is, of course, best adapted for use on large areas, where there is plenty of space for cutting rounded corners.



The Three Mowers, Held in a Fixed Position to Each Other by the Angle-Steel Frame, are Drawn by the Car at a Very Good Speed and Cut a 10-Foot Swath

Pinion Machined on a Shaper

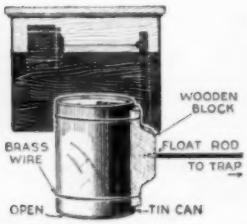
When a mine pump broke down, and emergency repairs became necessary, a pinion had to be replaced. The mine would fill up with water before a new pinion could come from the nearest supply point, so it was necessary to make one. The only machine available was a good shaper, and it was accordingly pressed into service. The pinion to be replaced was somewhat wider than the gear it meshed into, and consequently the teeth on one edge of it were not worn at all. When the blank for the new pinion had been turned up, it was forced on a mandrel, together with the old pinion. The mandrel was then mounted on the V-blocks on the shaper table, and clamped securely. The old pinion was used as a template to cut the new one, and the mandrel was revolved to the proper position for cutting each successive tooth with the shaper tool. Two cuts were made for each tooth—one with a parting, or cutting-off, tool, which removed most of the metal, and one with a side-cutting tool, slightly rounded at the point and ground to fit the side of the tooth.

In this way the breakdown, which had occurred at 4:00 p. m., was ended at 9:30 the next morning, and the new pinion ran with scarcely any more noise than the old one had been making.

¶A handle for a door which opened upward was made from an old shovel handle. The handle was cut off the shovel near the grip, and bolted to the door at a right angle, the bolt head inside the grip circle.

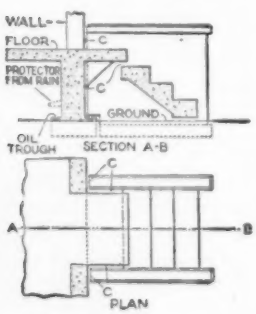
Tin Can with Open End Forms Emergency Float

A flat dweller made an effective repair job in a toilet tank by using an ordinary tin can. The float ball had become full of water, and sank to the bottom of the tank, so that the escape valve was kept permanently open. He substituted a small can for the ball, and attached it to the float rod by screwing the latter into a piece of wood which he fastened with wire to the can. The can was then placed in the water with the lower end open, so that it sank a short distance, and then floated like a diving bell, due to the presence of the air at the top. In this way the plunger at the other end of the rod was made to close the valve as effectively as when the float ball was in use.



Houses Made Proof against Ants and Insects

In many tropical countries, ants are a constant plague, and several methods have been devised to prevent them from entering buildings. One of these, familiar in the Canal Zone, is shown in the drawing. It consists of separately constructed steps and wall cheeks, which do not come in contact with the building, but leave openings, C, between. Small oil troughs in the foundation footings prevent the ants from passing there. The construction is very simple, and may be carried out in a variety of ways, according to the architectural layout. The floor of the building projects in the form of a cantilever at the top of the steps, and is slightly narrower than the steps below, so as to leave openings on each side. The troughs in the footings must be kept filled with oil, and all vegetation must be kept away from the walls and steps; it is necessary, also, to keep the gaps free from small articles and rubbish, which might bridge them.



Methods for Preserving Eggs without Refrigeration

Air which penetrates the shell of an egg carries destruction with it, so that processes by which the shells are made airtight are of great importance to the work of preservation. Different chemical preparations are used in coating the shells, and before they are applied it is advisable to cleanse the surfaces thoroughly. A rag dipped in chloroform is very effective for this purpose.

Among the best materials for coating eggs are paraffin wax, sodium silicate, and beeswax. If paraffin is used, melt the wax to a liquid, and dip the eggs one at a time, using an iron spoon. The sodium-silicate method is a little more complicated, as a certain portion of the chemical must be dissolved in boiling water until a rich, sirupy solution is obtained. Use three parts of water to one of silicate, and leave each egg a few minutes in the mixture, which should be quite hot. If beeswax is used, melt it in a dish over a gentle fire, and then mix it with olive oil. Four ounces of wax to eight of oil will be sufficient when the eggs are dipped one at a time.

With the boric-acid and quicklime treatments, no coating is applied. When using quicklime, mix 12 oz. with each gallon of water, adding 6 oz. common salt, 1 dr. soda, ½ dr. saltpeter, ½ dr. tartar, and 1½ dr. borax. Pour a quantity of the mixture into a barrel until it is a few inches deep. Put in a layer of eggs, pour quicklime over them, and place another layer of eggs above. Continue until the last layer of eggs is about 8 in. from the top of the barrel, fill the remaining space with quicklime, cover it with a cloth, and scatter lime upon it. The boric-acid treatment is a little simpler. Put five or six eggs at a time into a piece of netting, and plunge them for a moment into a boiling solution of boric acid and water. Bacteria are killed by the boiling acid, and the shell becomes strengthened with a thin layer of coagulated albumen. —S. Leonard Bastin, Bournemouth, Eng.

Chalk Used When Filing Lead

When filing lead, or other soft metals, it is well to rub a piece of chalk over the file before commencing work. The chalk prevents particles of metal from filling the file teeth. To clean the file, tap it against the workbench, and the filings will fall out.—J. N. Burns, Buffalo, N. Y.

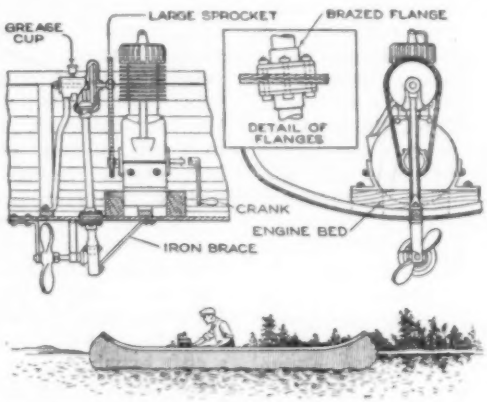
Amateur Mechanics
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Power Plant for the Canoe

By L. B. ROBBINS

A CANOEIST who can pick up an old chainless bicycle and a low-powered engine of suitable size and weight, such as a single-cylinder motorcycle engine, may easily make himself the possessor of a power-driven canoe. The illustration gives an idea of how this may be accomplished. No attempt has been made to give dimensions, as the style of canoe, engine, and bicycle will necessarily determine the details. The propelling mechanism is patterned closely after the average outboard motor in operation. It has the advantage of being very inexpensive.

The power is transmitted by a chain drive from the crankshaft of the engine to the bicycle crank, which is mounted in its hanger, forming the upper part of the transmission. Here the bevel gears from the chainless bicycle carry the power downward through the bottom of the canoe to the propeller shaft, to which connection is made by the small bevel gears taken from the rear hub of the bicycle.



The Driving Mechanism of an Old Chainless Bicycle can be Used for Fitting a Propeller to a Canoe

Saw off the rear forks of the bicycle, so as to remove the sprocket hub, the rear-gear housing, and shaft tube. The parts used consist of the driving gear, and that part of the frame which holds and contains it.

About 6 in. above the rear housing, where the rear-hub spring projects, saw the shaft tube in two parts. Before doing this it will be well to remove the driving gears and the shaft at each end. A wide flange must then be brazed, water-tight, to each section of the tube. An amount of tube must be removed before these flanges are brazed, sufficient to compensate for the added thickness of the two flanges and the bottom of the canoe, not including the keel piece. The flanges will be much more easily brazed at right angles, and since the tube will most likely have to project through the bottom of the canoe at an angle to it, it may be necessary to insert wooden angle shims, as shown in the detail, which must be fitted so as to be water-tight.

Remove the pedal hanger from the sprocket gear, and fit a steel shaft in its place, plugging up the unused end of the hub. The projecting end of the shaft should then be fitted with a large chain sprocket. Insert a grease cup over the main driving gears in the hub. Cut down the opposite fork, and flatten and bend the end, so that it can be bolted to the floor in line with the upper flange, and will act as a brace.

Next, bore a hole in the center of the bottom of the canoe at the desired point, removing about 6 in. of the keel piece at that point. Make the hole the same diameter as the inside of the shaft tubing. Reassemble the shaft and gears in the longest tube and set it in place in the canoe by bolting down the brace. This will set the upper flange over the hole. Then attach a suitable propeller, 8 or 9 in. in diameter, to the rear hub shaft in the rear housing. Set the short end of the tube on the bottom of the canoe, to fit the hole, and bolt the two flanges together, using rubber gaskets

under each flange to render the joint water-tight. Then set up the bevel gears of the under housing in their proper place, and replace the rear housing. If this housing does not furnish a suitable bearing in itself for the propeller and shaft, an auxiliary brace, to support the outer end of the propeller, can be attached to the keel, as shown, in the sketch. An iron brace, bolted to the propeller housing and to the keel as shown, will give additional strength. Any light single-cylinder motorcycle engine will provide sufficient power to turn this propeller.

The method of mounting the motor as illustrated is only suggestive. It will be necessary, in the first place, to provide a pair of heavy wooden blocks to which the motor can be bolted. The blocks can then be fastened to the ribs of the canoe with angle irons to keep them in position. Arrange a crank and pin on one end of the crankshaft, and a small sprocket on the opposite end, which will come in line with the large sprocket on the gear shaft. Connect these sprockets by a suitable chain. Gasoline tank, accessories, and controls can then be placed at suitable and convenient points along the inside of the gunwales. Make every effort to keep the weight as low as possible, to insure steadiness. The difference in the size of the two sprockets will, of course, determine the number of revolutions of the propeller when the motor is running at its average speed.

Photographing a Person "Floating in Air"

Pictures can be taken of persons while they are in mid-air, using ordinary cheap cameras, though some judgment is necessary. The photograph shows such a snapshot, made with a single-lens, fixed-focus, vest-pocket-size camera. The light must be good, even better than for an ordinary instantaneous exposure. Place the person to be snapped on a fence, porch railing, or other convenient place, at least 5 ft. above the ground. If possible, there should be a light-colored background, as in the photograph, so that the clothing of the subject will contrast with it. Point the camera at the feet of the subject while he is standing on the railing. Then count 100, 200, 300, 400 just rapidly enough to say the words distinctly. The subject must jump when 300 is spoken, and the shutter is snapped at 400. This should give time for the subject to be in mid-air. The result naturally depends on conditions, but with ordinary care, good light, an exposure of 1/25 second, and a fairly good camera, the trick should not be difficult.

Lantern Slides from Paper and Magazine Pictures

It is possible to make lantern slides, without going to the expense of photography, by transferring newspaper or magazine illustrations to the glass. The articles needed are some old camera plates, a glass cutter, transparent varnish, some transfer solution, which can be made cheaply at home, and the illustrations. To make the transfer solution, dissolve a bar of soap in 1 gal. of hot water, and add 1 pt. of turpentine. Let it stand overnight, stir well, and bottle.

Then cut a camera plate to the size of a standard slide, wash off the emulsion, and apply a coat of transparent varnish to one side. When this has dried, cut a picture the same size as the slide, and apply a coating of the solution to its face with a soft brush. Place the print, face downward, on the varnished side of the glass, and rub the back of it with the hand. Take the print off the slide, and it will be seen that the picture has been transferred.

To color the slide, use oil paint, but apply only a thin coat, as oil colors are not so transparent as aniline, and the latter cannot be used satisfactorily on a varnished surface. The color will take a day or two to dry.—William T. Grinstead, Columbia, Mo.

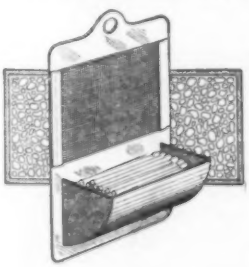
Camping Hints for the Beginner

The pleasure of a camping trip depends so much on the baggage carried for clothing, food, and equipment, that judgment shown in listing the articles makes as much difference as the choice of the location. For provisions, take as much

canned food as possible, depending for fresh meat on the fishing line and rifle. Sufficient variety will be found in canned soups, fruit, and vegetables; a ham, a rasher of bacon, coffee, condensed milk, sugar, pepper, salt, cornmeal, flour, potatoes, onions, cookies, crackers, and butter. Cups and plates should be of tin, and for cooking, take a frying pan, a small gridiron, two kettles, two iron pails, and two coffeepots. For fishing, take a heavy trolling rod with 100 yd. of trolling line, and spoon hooks, carrying a light rod for casting, and bait hooks with flies, if the camp is near a trout stream.

The important part of a camper's clothing is underwear, a spare winter suit being indispensable, as well as a sweater and several pairs of stockings. The tent should be of the wall pattern, as it gives more room than the conical type, though it takes a little longer to pitch; and unless the location is on rising ground, be careful to dig a trench around it for surface drainage. Tent poles can be improvised on the camping ground, but carry a rubber blanket to sleep on and several blankets for covering. To build the cooking fire, use a large, flat bowlder for the back of the fireplace, with the front facing any lake or open space from which a breeze is likely to blow, and build the sides 5 ft. apart by piling stones rather more than 1 ft. high. These will support green sticks laid across them to hold the frying pan after the fire has ceased to blaze and come to a red glow. A pot for boiling can be hung from a horizontal stick supported by two forked uprights.—F. H. Sweet, Waynesboro, Va.

Wire-Mesh Scratcher on Match Box

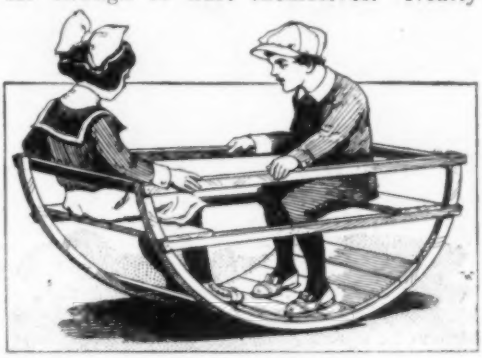


A small fine-mesh wire screen makes a more durable match scratcher than the sandpaper kind, which wears out in a short time. The screen is soldered to the box.

¶When caterpillars become a pest they can be burned from trees very easily by using a pole with some wire screening on the end of it, formed into a cone-shape, and containing a piece of lighted cloth soaked in kerosene.

Toy Rocker for Small Children

A farmer used a worn-out wagon wheel to make a rocker for his children, and found that it gave them more pleasure than a swing or rocking-horse. No matter how often they overturned it or how roughly they played, they could not fall far enough to hurt themselves. Nearly



A Toy Rocker is Made Cheaply from a Light Wagon Wheel, and Provides Healthful Exercise with Great Safety

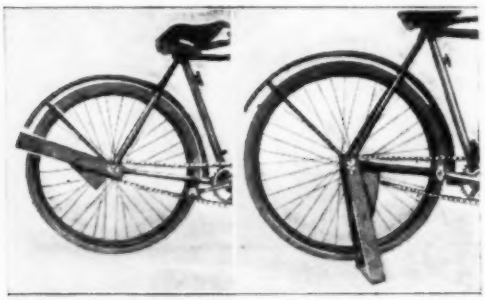
the entire felloe was used, portions slightly less than one-half being cut to form the side frames, which were held together at the ends by strips of wood about 18 in. long. Two wooden braces at each side completed the frame, and floor boards, ½ in. thick, were nailed at the bottom, while seats were formed by nailing ½-in. boards to the lower pair of side members, 12 in. below the top of the frame.—C. A. Black, Jr., Hightstown, N. J.

Inverted Desk Drawer Holds Typewriter and Eraser

It is not unusual in flat-top desks to find a drawer, the top of which is at just the right height for a typewriter table. If this drawer is removed and inserted upside down, it will, in fact, form a very handy place to set the typewriter, as it can be reached by the operator without changing the position of his seat, and at the same time, the whole surface of the desk top is left free. In the case illustrated, the handle of the inverted drawer was made use of as a receptacle for the eraser. —S. R. Mills, Saranac Lake, N. Y.

A Simple Wooden Bicycle Stand

The homemade bicycle stand shown in the illustration was made almost without expense, and yet combines strength with

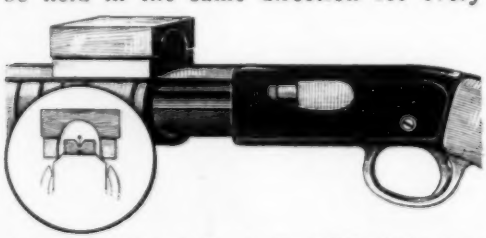


A Light Bicycle Stand, Made of Strips of Wood, is Attached to the Machine as a Permanent Fixture, without Impairing Its Appearance

extreme lightness. It consists of a three-sided wooden frame, the two uprights being about 7 in. apart at the bottom, but close together at the top, with a small hole bored through the upper extremity of each. Metal mounting steps, fastened to both sides of the bicycle frame, enter the holes in the uprights, and the length of the horizontal strip at the bottom of the stand gives it sufficient foundation to hold it steady. Blocks of wood, nailed to the uprights, strike the horizontal fork of the bicycle frame, so that the frame is kept from slipping backward. A metal clip may be riveted to the end of the rear mud guard, to hold the stand in a horizontal position when not in use.—R. Huddlestone, Victoria, B. C., Can.

Sunshade for Rifle Sight

The glitter of sunlight on the notch in the rear sight of a rifle is sometimes a great annoyance, particularly in stationary-target shooting, when the rifle must be held in the same direction for every



A Small Cardboard Box is Used Effectively as an Aid to Clear Vision at Target Practice

shot. To avoid this, make a semicircular cut in each end of a small wood or cardboard box, turn it upside down, and set it astride the barrel just over the rear sight. The box forms a small tunnel over the sight and keeps it continually in the shade.—Willis E. Berg, Flagstaff, Arizona.

Drinking Cups Used as Torches

While a meal was being served in a large mess hall, the electric-light circuits went out of commission, and no candles or other means of illumination were available. There were, however, a number of drinking cups made of paper treated with paraffin wax, and an experiment with one of them showed that the material could be used as a torch when twisted into cylindrical shape. It burned for about five minutes, and gave a steady light with hardly any smoke. The cups were accordingly used for illumination until the current was turned on again.—Francis W. Nunenmacher, Berkeley, Calif.

A Fan Made of a Fountain Pen

It is hardly convenient to carry a fan at all times during warm weather, but at many an odd moment it is a distinct relief to have one. A fountain pen and a few calling cards provide the materials for a very handy makeshift. Large business cards will, of course, give the best result, and if the spring clip of the pen is a strong one, it will hold all the cards in position even when the fan is used vigorously.—Frank W. Bentley, Jr., Missouri Valley, Ia.

Catching Mice on Fly Paper

A household which was plagued with mice found that the animals gained access to a cellar by sliding down a wire. A large piece of fly paper was therefore placed at the lower end of the wire, so that the mice dropped directly onto it; and as all four feet were caught at once, they had no way of freeing themselves. A mouse was caught in this way every day until they ceased to cause trouble.—Mrs. O. G. Romig, Denver, Pa.

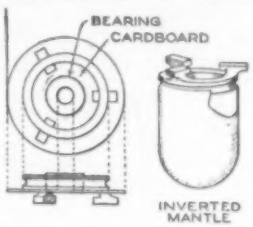
¶A piece of carpet, mounted on a small wooden block, is useful for removing dirt and grit from phonograph records.

Perfumes Made from Flowers in the Home Garden

The readiness with which odors can be communicated to fatty substances provides us with two methods of making perfume. One of them is called "maceration," where fresh flowers are laid from day to day during a period of weeks in the same bed of slightly warmed fat. The other method is called "enfleurage," where the flowers are renewed daily in unheated fat or oil. The fat must be cut into very small pieces and boiled, after which it should be skimmed until absolutely clean, odorless, and free from water. Perfectly fresh, odorless beef-kidney suet is good for the purpose. Gather the blossoms when they are most fragrant, which is usually in the morning; discard everything but the petals, and, if the enfleurage process is to be used, put them at once into frames, made of small, shallow boxes from which the tops and bottoms have been removed. These four-sided frames must be all alike in size and shape, each with a partition, made of glass or coarse-mesh wire netting, midway between the top and bottom. Glass is needed when the perfume is to be absorbed by layers of fat, and netting, when soft cotton mats are used soaked in olive oil. If fat is used, spread a layer on the glass, ⅜ in. deep, and cover it thickly with blossoms. Place a second frame above it with its glass partition greased above and below, so as to protect the flowers underneath and to serve as a bed for others on the top. When these are in position, continue upward until the whole stock of flowers is used up, and lay a thick cloth over all, to prevent the fragrance from escaping. Leave the blossoms in the frames not less than 12 hours and not more than 24, after which separate the frames and renew the blossoms. The fat is left where it is until it has absorbed perfume up to the desired strength, which is determined by the ratio of the weight of the flowers to that of the fat. Tuberose perfume requires 3 lb. of blossoms to 1 lb. of fat; jonquil two to one; jasmine three to one; violet four to one; while rose perfume needs 10 lb. of petals, after separation from the blossoms, to 1 lb. of fat. The result of the absorption is a strongly scented "pomade," from which the fragrance is extracted by chopping it small and placing it in a fruit jar, where it should be covered with the finest odorless alcohol. It should stand in the jar for three or four weeks. During this period the perfume will be transferred to the alcohol, which can then be strained into bottles to make a stock solution; but it must be further diluted with pure alcohol for general use, as the fragrance of the concentrated extract is extremely strong.

Pulley for Toy Machinery

The metal ring used to hold an inverted gas mantle can be used to good advantage as a grooved pulley, by model builders and toy enthusiasts. Its shape and character make it an ideal pulley, and one that can be easily procured wherever gas is used. Cut out a heavy cardboard, or wooden, disk somewhat larger than the ring, and glue the two together so they fit concentrically. Then fit a shaft to the center of the disk, or drill a center hole through it, if thick enough, to receive a shaft. The grooves are deep in these rings, and they will run better than wooden or lead pulleys.—L. B. Robbins, Harwich, Mass.



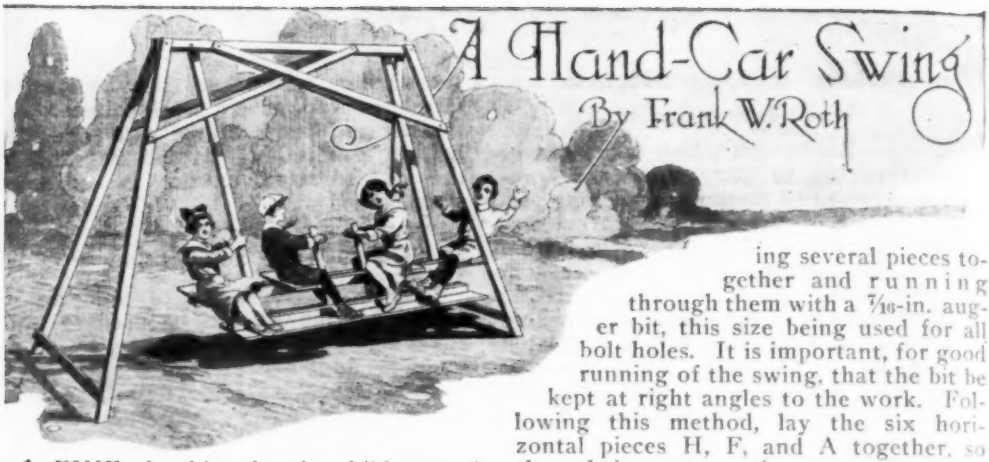
Making Fire Pictures

A simple chemical formula provides a method of making pictures and decorative designs on paper by burning away the material in whatever direction the lines of the design are planned. Dissolve two parts of saltpeter and one part of gum arabic in two parts of water, and when the solution is fluid enough to flow from a pen, draw a design on a sheet of white paper. Be careful to make all the lines connect, and run one of them to the edge of the paper, marking the point where it ends with a small pencil cross. When the lines are dry they will be almost invisible; but if a match is applied to the penciled cross, the chemical will burn continuous tracks wherever the design has been drawn. Before igniting the train, raise the surface of the paper by bending it down at all four sides about ¼ in. from the edge. This will allow the fire greater ventilation, and will enable the ashes to fall below the paper, thereby giving clearer definition to the lines.

¶ Soda-fountain straws dipped in melted paraffin make good insulation for low-voltage wires.

A Hand-Car Swing

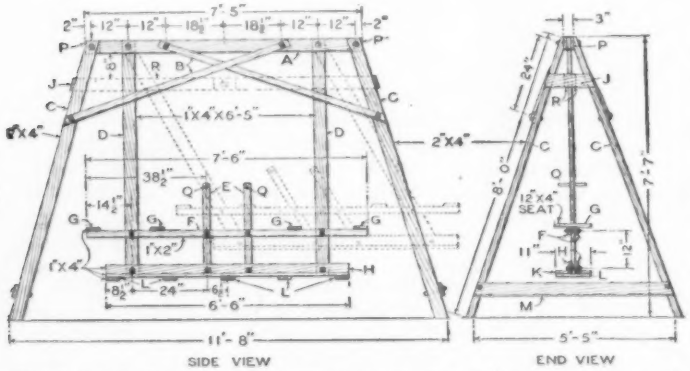
By Frank W. Roth



A FINE plaything for the children, and one that is easily and cheaply made, especially if some lumber has been left over from a building job, is a swing which is operated by hand levers, as laid out in the working drawing. It is fully strong enough for adults. Most of these will probably not see much fun in the seating arrangement, but two or four youngsters will not require much argument to be convinced of its possibilities as a fun producer.

All material required, with the exception of a few nails, is included in the list below. Substitutions can be made in many cases where lumber of different dimensions is easier found, but if the material is at hand exactly as called for, considerable time may be saved in fitting. The quickest way to make the swing is to cut the lumber fairly accurately to the lengths given. The bolt holes can then be bored before any of the parts are assembled, and all that will remain, after bolting the pieces together, is to trim off a few projecting corners. In boring these holes, much time will be saved by clamping several pieces together and running through them with a 7/16-in. auger bit, this size being used for all bolt holes. It is important, for good running of the swing, that the bit be kept at right angles to the work. Following this method, lay the six horizontal pieces H, F, and A together, so that their center points come together, and the projection of the longer pieces beyond the shorter ones is the same at both ends. Then bore holes, 30½ in. on each side of the center point, or 14 in. from the ends, of A. All these bolt holes are bored on the broad sides of the pieces, directly on the center lines, or midway between the two edges.

Before removing the clamps from the boards, bore the two holes in the two pieces A, 2 in. from each end. The boards A should then be removed from the pile, and the four pieces F and H clamped together so that the end holes register with each other; two other holes should now be put through the four pieces, 24 in. from the holes previously driven. These new holes will thus be 13 in. apart, and are used for attaching the levers E. In similar fashion, clamp together the four pieces E and D, so that all four are flush at one end. At distances of 2 in. and 14 in. from this end, bore holes, and at a distance of 2 in. from the other end bore holes, which will, of course, pass through the long pieces D only. The clamps should then be removed, and the shorter pieces E can be clamped together again, if desired, for the two holes at the top, which are 2 in. from the top end. The two pieces A should again be clamped together, and two holes bored 12 in. further toward the center than previous ones, these being then 37 in. apart. Next, the four pieces B are clamped together, and holes made 2 in. from each end, these holes being then 6 ft. 2 in. apart, center



The Swing is Operated by the Hands of the Two Occupants Nearest the Center, and will Furnish Plenty of Exercise as Well as Pleasure

to center. The boards C should all be beveled off at one end to an angle of 20°, as shown, and holes made 2 in. from this end perpendicular to the beveled face—not to the length of the board. One hole is made in each piece C at a distance of 24 in. from the nearest side of the hole through the bevel, measuring, of course, center to center. Four blocks, P, used as spacers, are each bored with one hole directly through the center.

The lower edges of the boards H are nailed to K, as shown in the end view, to form members of L-shaped section. These are then set together, leaving just enough space between the pieces H for the uprights D to move freely, and the five crosspieces L are nailed on securely, nails being driven into both boards K and H. The two boards F may be assembled temporarily in position on the uprights D, leaving them loose enough to work freely, and the seats G can then be nailed in position. Two pieces of strong broomstick, or curtain pole, Q, about 9 in. long, are driven through holes of suitable size, bored in the upper ends of E, to serve as handles.

The swing is now ready for assembling. Three-eighths-inch bolts are used throughout, all being 3½ in. long, except those joining the pieces A and C, which are 5 in. in length. Jam nuts, cotter pins, or other suitable locking arrangement, must be provided for all bolts passing through the parts D, F, and H, so that the nuts will not drop off. It will be convenient to assemble first the stationary frame, then the swinging portion, and finally hanging the uprights D from the top beams A. The assembly of the swing will then be completed by nailing on the braces J and M.

One more addition may be made, however, in case it is found that there is any dangerous tendency of the swing to run over against the frame when in motion. This tendency may appear if the work is not very accurate, and, if necessary, it may be corrected by installing the guide R extending between the two braces J, and bolted together at the center with a spacer of the proper thickness between them. It will certainly be necessary to caution the youngsters against letting their arms or hands project too far to the side when the swing is in rapid motion. The same applies, of course, to lawn swings of the ordinary type, and if ordinary care is exercised, the hand-car swing should be productive of a great deal of pleasure and no accidents.

MATERIAL REQUIRED

A—2 pieces, 1 by 4 in. by 7 ft. 5 in.
B—4 pieces, 1 by 2 in. by 6 ft. 6 in.
C—4 pieces, 2 by 4 in. by 8 ft.
D—2 pieces, 1 by 4 in. by 6 ft. 5 in.
E—2 pieces, 1 by 2 in. by 2 ft. 8 in.
F—2 pieces, 1 by 2 in. by 7 ft. 6 in.
G—4 pieces, 1 by 4 in. by 1 ft.
H—2 pieces, 1 by 4 in. by 6 ft. 6 in.
J—2 pieces, 1 by 2 in. by 1 ft. 3 in.
K—2 pieces, 1 by 4 in. by 6 ft. 6 in.
L—5 pieces, 1 by 4 by 10½ in.
M—2 pieces, 1 by 4 in. by 4 ft. 11½ in.
P—4 pieces, 1 by 4 by 4 in.
Q—2 pieces, 1 in. round by 9 in.
R—2 pieces, 1 by 4 by 8 ft. 2 in.

How to Grow Dwarf Trees

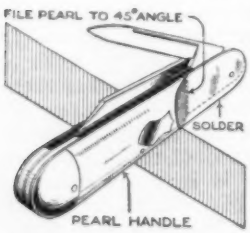
Miniature trees used as parlor decorations generally belong to species which under ordinary conditions grow to a much greater height. These particular examples owe their small size to the fact that their growth has been artificially stunted. The process is simple. Cut a thick-skinned orange in two, and remove the pulp from one of the halves. Coat the skin on the outside with shellac to preserve it, and fill it with fine, rich soil. Plant two or three seeds of some evergreen tree in the soil, and set it in a room where the growing plant will get plenty of sunlight. Be careful to prop up the skin in such a way that the shoot will grow vertically; do not allow the room where it stands to become overheated, and water the soil in moderation from time to time. When the roots force their way through the peel, cut them off flush with its outer surface, and in doing so be careful not to injure the coat of shellac. After the plant has attained maturity it may be placed in a large flowerpot, and will continue to thrive there; but as its roots have been curtailed, it will be unable to draw more than a reduced amount of nourishment from the soil, and so its growth will be permanently stunted. Cedars, pines, and even some fruit trees, endure this process remarkably well.

Right Angle for Sawing Found by Reflected Light

When a board is being divided with a saw, the cutting line can be kept at an exact right angle to the board without the aid of a square, if the surface of the saw is bright enough to reflect an image. As long as the right angle is maintained, the edge of the board and its reflection will appear like one continuous straight line; but otherwise the two will seem to be inclined to each other.—Abel Green, New York, N. Y.

Pearl-Handled Knife Repaired with Solder

Sometimes a pearl-handled knife becomes broken while one is endeavoring to use it as a screwdriver. The break usually occurs at the blade end, and many persons might throw away a good knife because of the occurrence. However, the illustration shows how to repair such a break. File the pearl back until a fairly even 45° angle is obtained. Then, by using a good soldering "acid," clean well the brass lining which has been exposed by the missing pearl, and proceed to build up the hollow spot with solder. After the solder has been allowed to cool, clean off the surplus solder with a file, or knife, so as to have its shape conform to the rest of the knife handle.

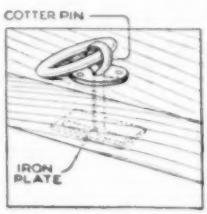


Invisible Writing without Chemicals

Hidden records can be preserved, and secret messages transmitted, by means of invisible inks and cryptograms; but chemical formulas are required for the former, and the latter entail the labor of decoding. To dispense with both, soak a sheet of white paper in water for a minute or two, and then lay it upon a smooth, hard surface—preferably a sheet of glass. Lay another piece upon it, and write the message on the upper piece. This can be done with a match, or anything else that will cause a fairly heavy pressure where the strokes are made, a pencil being preferable, because it enables the writer to see his message. Remove the top piece of paper, and the message may be distinctly read on the lower piece. When the paper becomes dry the traces of the words will vanish, but can be made to reappear repeatedly by moistening the paper.—S. G. Stephen, Trinidad, B. W. I.

Ring Bolt for Canoe Made of Ring and Cotter Pin

There is a good deal of risk in the common practice of using a screw eye to hold a mooring ring to the deck of a small pleasure boat. The threads tend to wear loose in the wood, and an unexpected strain may set the boat adrift at a most inopportune time. In addition, any stranger who takes a notion to unscrew it can do so in a moment. It is better, therefore, to make a more permanent fixture, and about the cheapest appliance is a brass or enameled-iron harness ring, held by a $\frac{3}{16}$-in. cotter pin, about 2 in. in length. It is advisable, also, to let the pin pass through a $\frac{3}{4}$-in. metal disk before entering the surface of the deck, and on the lower side it should be clinched tightly against an iron plate, about 1 by $\frac{1}{2}$ in. in size. The disk improves the appearance of the attachment, and protects the upper surface of the deck, while the iron plate serves the same purpose underneath.—C. C. Davis, Annapolis, Md.



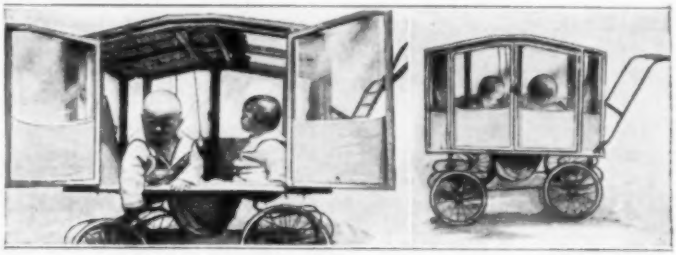
Alarm Clock Adapted for Store

An alarm clock, fitted with a mahogany face, and with hands and letters cut out of brass, was hung in a store, where it makes a very good appearance.

¶ When polishing paste cannot be obtained for brightening nickelplated surfaces, good results can be secured with gasoline or kerosene.

Babies Get Fresh Air and Sunlight Undisturbed by Flies

This screened-in bedroom and perambulator was designed by the father and mother of the happy twins seen inside it. The running gear was constructed by a blacksmith; it has double-action springs, which give the cab plenty of bounce, and has the usual rubber-tired wheels. The frame is entirely inclosed by screen wire, and there are double doors, opening at the sides. These are securely fastened to prevent the babies from tumbling out.



Comfort for the Babies, Freedom from Worry for Their Mother, and Great Satisfaction for Their Father, Were the Results of This Fly-Proof, Fresh-Air House on Wheels

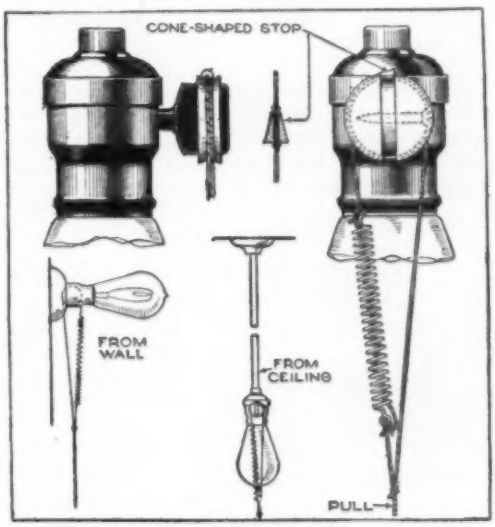
Through openings in the floor, the babies' feet go into the canvas bags that extend underneath the cab, when they are sitting up. Canvas flaps button over their laps to hold them steady. When a smooth floor is desired, so the babies may lie down, the foot bags are drawn up and fastened, and the flaps buttoned down to close the opening.

Overhead curtains, designed to keep out an excess of sunshine, slip back and forth on wires. Side curtains extend about halfway up the doors and sides. Canvas curtains at each end can be raised and hooked to the framework, thus providing small back rests and also serving to regulate the supply of air. In this airy cab, the babies can enjoy either an outdoor or indoor nap without a fly to disturb their slumbers.—Delphia Phillips, Long Beach, California.

Changing Key Sockets to Real Pull Sockets

Electric lights on the wall, or on fixtures that are firmly secured, may be operated from the floor by a very simple arrangement, as illustrated. The key of the socket is made into a wheel by the addition of two half-circular pieces, grooved on the outer surface. They are attached to the key by drilling a small hole through its center and screwing the two halves together through the hole. This may also be accomplished by making a slot in a wooden wheel, to receive the key very snugly.

A cord, or narrow tape, and a very flexible spiral spring will be needed. The cord is attached, as shown in the sketch, so as to limit the distance it can be pulled against the spring to that necessary to turn the key the proper distance. When the key turns easily, it is not necessary to secure the cord to the wheel, but if it slides, it may be supplied with a little cone-shaped brass stop, as suggested in the detail. This stop engages the edge of the half wheel in the space between the halves, these being of a slightly greater diameter than the width of the key. To operate, pull down on the cord below the point where it joins the lower end of the spring. The spring elongates, and in so doing, permits the cord to grip the wheel on the key and revolve it the desired distance. When released, the pull of the spring on the cord permits it to slack and return to its former position. When the cone is attached to the cord, it engages

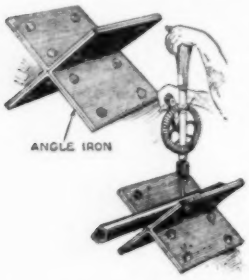


An Ordinary Key Socket may be Operated by a Pull, When Fitted with This Simple Homemade Device

the edge of the half wheel and turns the key. When the pull is released, the stop runs back to its former position, engaging the opposite slot, and is ready to be operated again.—H. E. Gifford, Medford, Mass.

V-Blocks Made from Angle Irons

Many bench jobs are simplified by using a V-block made of angle irons riveted together. In one position or another, the appliance will hold round, square, or flat stock; and in some operations, it can even be substituted for a vise, with the additional advantage that it is easily moved from place to place. Cut four lengths of 1½-in. angle iron, making each piece 2 in. long, and use a file to smooth the edges and the surfaces that are to be riveted together. Drill and countersink the rivet holes, and file the rivet heads smooth when the parts have been joined together.—Carl L. Rynning, Brooklyn, N. Y.



Handlebar Clamp Permits Carrying Vacuum Bottle on a Motorcycle

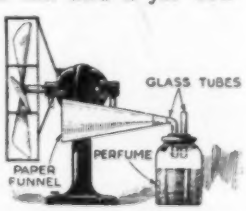
Motorcyclists who have tried various methods unsuccessfully for carrying the vacuum bottle on a motorcycle without breaking the glass container, may be interested in the clamp illustrated, which carries the bottle in such a way as to minimize vibration, and has been found quite successful. The clamps which hold the bottle to the handlebar are provided with wing nuts, which compress bands of thick felt against the sides of the bottle under the metal bands. The comparative freedom from vibration in this position seems to be largely due to the fact that it is directly above the spring forks. The owner says he has ridden some very bad roads, and has had two bad "spills" without breaking the bottle. Although removal or replacement of the bottle takes but a short time, it is not necessary to remove it in order to pour out the contents. Simply tilt the machine, remove the cap from the bottle, hold the cup in front of the opening, tilt the machine the other way, and out comes the contents of the vacuum bottle.—John E. Hogg, Los Angeles, Calif.

Anvil for Triple-Gear Rivets

Triple gears from light automobiles are often thrown away because the rivets holding the gears together are loose. In many cases, the teeth of the gear are not worn out by the time the rivets are loose, and the gear may be made to serve for another season by tightening the rivets. This is not a difficult task if the anvil described is used. Either a bushing or a short piece of pipe is screwed into a 1¼-in. pipe coupling, and then sawed off flush with the end of the coupling. When filed off flat, this forms an anvil which fits into the triple gear, and comes against all the eight rivets that hold the gear together. The anvil is placed on a solid block, and the mechanic can then tighten the rivets by battering the ends with a punch. Unless there is such an anvil handy, the job is difficult to manage, as the rivets are hard to get at. A gear tightened in this manner has been known to wear two seasons.—Fred Page, Winfield, Kan.

Perfuming the Air in a Room

Any kind of fragrance desired can be communicated to the atmosphere in a room by means of a fan and a jar containing perfume. Thrust two short tubes through the stopper of a wide-necked bottle or jar, one of them being bent at a right angle. The jar should be about half full of perfume, and neither of the tubes should be long enough to reach its surface. Fit a paper funnel to the



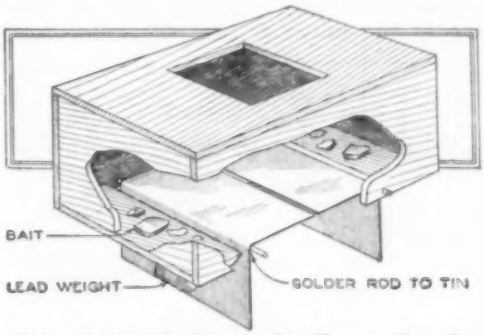
horizontal part of the bent tube, and place a fan in front of it with its back to the jar. When the fan is in motion, it will suck perfumed air from the interior of the bottle, and the vacuum thus created will be filled by fresh air admitted through the other tube. This will in turn become perfumed, and subsequently distributed by the fan through the room.—Violet Johnson, Rockford, Ill.

Combined Pail and Funnel for Boats

On a motorboat locker space is valuable, and for this reason boatmen are disinclined to carry articles which are not in constant use. It is quite usual, therefore, to leave the gasoline funnel behind when on a trip, and to trust to each gasoline dealer to provide one which will not be too large for the filling hole or too short to reach through the deck to the tank. Unfortunately, these conditions are not always realized, and, to avoid trouble as well as to save locker space, a boatman devised this method of converting a pail into a funnel whenever necessary. He soldered a small iron plate to the bottom of the pail, and drilled a hole through both plate and pail, tapping it afterward to admit a short piece of pipe. This provided him with a funnel whenever he desired one, and by substituting a threaded plug for the pipe, he turned the funnel into a pail again.—Wm. F. Crowell, Providence, R. I.

Rat Trap Requires No Resetting

The chief merit of the trap shown in the sketch is that it needs no attention after it has been placed in position, and will catch one rat after another without being reset, or baited, afresh. It is placed over a hole in the covered top of a barrel, or large box, and the rodent enters through the roof of the trap, plunges through the false bottom, and falls into the barrel. The trap is made of wood throughout, except the floor, which is formed by two tin plates. These are bent into the shape shown, and supported by wire rods which act as hinges, so that the two horizontal leaves swing downward under the weight of an entering rat, but are kept in equilibrium at other times by small pieces of lead soldered, or wired, to the vertical portions. In constructing the trap, it is important to place the bait pans sufficiently far from the hole in the roof to insure that the rats will lose their foothold on the wood, for it is necessary

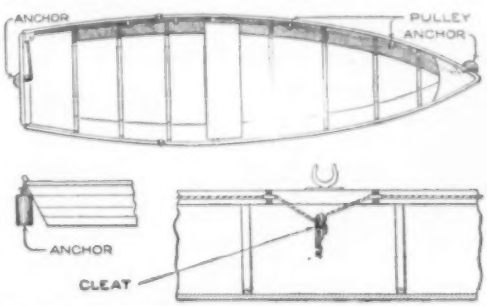


With a Collapsible Floor a Rat Trap is Kept Permanently Set, and Renewal of the Bait is Made Unnecessary

that their whole weight should fall on the false floor, so that they will be unable to save themselves. If the barrel contains enough water to drown the rats, the work of destroying them will entail no further trouble.—Omar M. Highley, Converse, Indiana.

Fishing-Boat Anchors Operated from the Seat

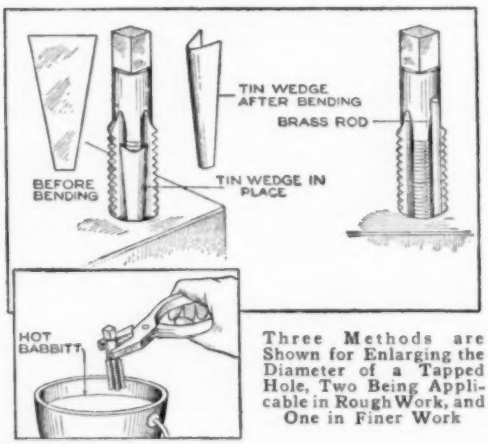
The inconvenience of traveling from one end of a rowboat to the other in heaving or raising the anchors can be dispensed with by adopting the simple method illustrated. Holes are made in the woodwork at both bow and stern, through which the ropes reach to the anchors hanging outside. Each line runs through a series of pulleys along the inside of the gunwale, to a cleat placed near the rowing seat—a handy point is directly beneath one of the oarlocks. When casting anchor, it is only necessary to release the ropes at the cleat; when raised, they are fastened as indicated.



With the Rope-and-Pulley Attachment, the Fisherman Has His Two Anchors at His Fingers' Ends

Making a Tap Cut Large

The drawing shows three methods of making a tap cut a thread slightly larger in diameter than it would otherwise. The two in the upper picture are crude but



Three Methods are Shown for Enlarging the Diameter of a Tapped Hole, Two Being Applicable in Rough Work, and One in Finer Work

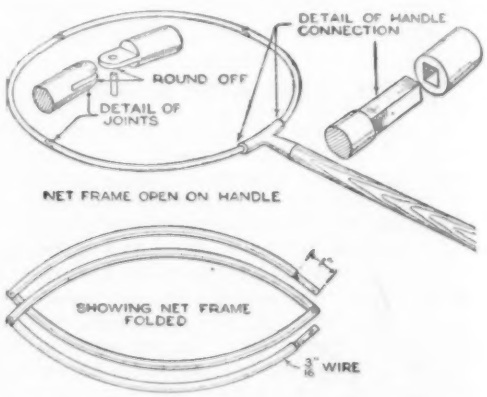
effective methods, where great accuracy of thread is not required. The tin will, of course, be bent to fit into the threads between the tap and the thread it cuts, so the enlargement will be but little more than the thickness of the tin. By using wires of different size in one flute of the tap, it is possible to vary the size of the tapped thread, within narrow limits. Where a more accurate job is required, with less enlargement, the tap can be heated by dipping it in melted babbitt metal, which will expand it. With all these methods, it is best first to run the tap through in the ordinary way, afterward enlarging the diameter by running it through again.—C. H. Willey, Concord, New Hampshire.

Imitation Marble Finish Produced by Candle Smoke

The tedious process of making veins in an imitation marble finish can be shortened by using smoke. The surface to be finished should be thoroughly prepared with No. 1 sandpaper, after which two coats of flat white should be applied, each coat, when dry, being smoothed with No. 0 sandpaper. Then apply another coat of flat white, tinted with lampblack, and add a little varnish. When this coat is nearly dry, lay the article on its side, light a candle, and hold it near enough to the surface to allow the smoke to play over it. Draw it back and forth with quick, even movements, working from the bottom to the top so that any of the upper parts which have been darkened by the rising smoke will be treated last. After the whole area has been covered, a little color may be used in imitating different kinds of marble, and when the surface is thoroughly dry, it should be smoothed with sandpaper and varnished. —John L. Jacklin, Flushing, L. I.

Folding Butterfly or Landing Net

A folding butterfly net that can be carried in a coat pocket makes a naturalist's field outfit less cumbersome, and such a net can be made large enough for landing fish, without being more than 10 in. long when wrapped in a bundle. Make the circular frame by cutting four pieces of 3/16-in. steel, or brass, wire, 12 in. long, and bend each of them to the shape of a quadrant of a circle, thereby making the completed circle about 15 in. in diameter. The parts are tongued and grooved at the ends, so that tongues fit into corresponding grooves at three of the joints, and at the fourth joint, the members fit snugly into a squared sleeve, brazed to a tapered ferrule, which receives the end of the shaft. When the tongues are placed in position for assembling, drill small holes for rivets, but be careful not to let the members fit too tightly after riveting. They must be tight enough to make the frame rigid when the net is being used, without making it difficult to fold it afterward. The wooden shaft must be suffi-



The Frame of the Butterfly Net Folds Up to a Package 10 Inches Long, So That It can be Readily Carried

ciently thick to make a tight fit when thrust into the tapered ferrule; and the net may be held onto the frame by spring fasteners, or even by safety pins.

Kerosene in Cloth Kills Flies in Garbage Can

Dead flies are a danger to the health of a household. Unless they are swept away with all other kinds of refuse, they can still spread infection, and it is therefore a good plan to use the garbage can itself as a flytrap. The insects swarm there, so that many can be killed at once, and after falling into the can they do not need further attention. Solder two pieces of wire in a horizontal position inside the lid of the can, and stretch a cloth from one to the other, saturating it with kerosene. The fumes will kill all flies which approach close enough, as long as the cloth remains damp, and after it dries it can easily be saturated again.—Albert B. Meyer, Chicago, Ill.

Tires for Doll-Carriage Wheels

The worn-out tires of a doll carriage can be replaced with insulated wire. Cut the wire to the length of the wheels' circumference, and leave 1 in. of bare wire projecting at each end. Put both ends through a nail hole, punched in the rim of the wheel, and bend them back to secure the tire. The joint will hardly show if properly taped.—Edwin L. Camp, Huntington Park, Calif.

The Self-Balancing Egg Trick

Blow the white and yolk from an egg, and fill one-third of the interior with fine sand. Stop the holes with a paste made from white of egg and powdered lime. The egg can then be balanced in any position, as the sand will always settle at the bottom. To remove any suspicion of the audience, pass another egg for examination, and substitute the prepared egg when about to perform the trick.—Hall Axtell, Amarillo, Tex.

Writing on Photo Negatives

Any marking which is desired to be placed on a photographic negative, so that it will show on all prints, may be written on the back, or shiny, side of the film with India ink, using a clean pen. The lettering may appear in the blank border or in any clear portion of the negative; it will, of course, appear white in the prints.

A Grass or Pine-Needle Tent for the Summer Camp

A most useful sleeping tent for campers can be made from long grass or pine needles when either of these materials are available in sufficient quantity. The poles are cut and erected for whatever size of tent is wanted, and small pieces of wood are laid, about 4 in. apart, to form the framework of the roof extending from the ridgepole to the ground. These are then covered with the grass or pine needles. The odor from the boughs is a great help toward a healthful sleep.

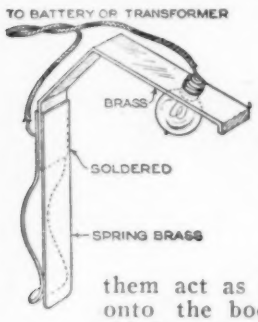
A Small but Pleasant and Healthful Sleeping Tent can be Made from Long Grass or Pine Needles

Drawing Milk from Bottom of Pan

The "cream separator" shown in the illustration, while not able to make a complete separation of milk and cream, is useful when milk is wanted before the cream has been skimmed off. Punch a small hole in the bottom of the pan used to hold the milk, and plug it with a stopper cut from wood or cork. Fill the pan, and when the cream has partly risen, there will be no difficulty in drawing milk from the bottom without disturbing the cream which has risen to the top.

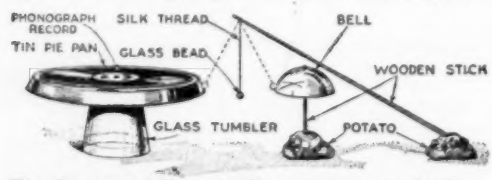
Miniature Reading Light for Hot Evenings

When reading on a porch at night in warm weather, it is not always desirable to have the whole veranda illuminated, and a small reading lamp which can be attached to a book cover makes this unnecessary. Cut three short strips of brass about the same length, and solder them together as shown. Two of them act as a spring clip to fit onto the book cover, and the third serves as a lamp bracket. The latter is bent into such a position that the light will be thrown directly onto the page, and the width of the metal prevents it from shining in the eyes of the reader. The lamp is of low candlepower, of the type used on Christmas trees, and is fitted tightly into a hole drilled through the bracket.—William Warnecke, Jr., New York, N. Y.



Ringing a Bell by Charges of Static Electricity

Cut an apple, or a potato, in two. Fasten, upright in one of the halves, a stick, 4 or 5 in. long. On the top of this stick attach a bell taken from an old alarm clock. Invert a glass tumbler, and place upon it a tin pie pan so that the edge of the pan will be in line with the edge of the bell. Insert slantingly, in the other half of the apple or potato, a very dry slender stick, 1 ft. or so long. At the other end of this stick, fasten a silk thread with a glass bead tied to one end of it, so that the bead comes on a line with the edges of the bell and pan. Charge a phonograph record, or piece of paper, by means of a static machine, or by stroking the record or paper with cat's fur, or with a silk cloth. Lay the record, or paper, on the top of the pie pan, and the glass bead will begin to swing quickly back and forth between the bell and pan, thereby causing the bell to ring.



The Passing of Electric Charges between the Pan, the Bead, and the Bell, Causes the Latter to Ring

The explanation of this is simple. The pie pan is positively charged and the uncharged bead is attracted by the pan. The moment the bead touches the pan, it becomes positively charged and is repelled. The uncharged bell attracts the positively charged bead. When the bead touches the bell it becomes discharged and falls back, and is again attracted by the pan. The frequency with which it repeats this cycle depends on the charge in the pan. A greater charge can be obtained on a dry day than on a damp one.—B. Jackson, Logansport, Ind.

Alternating Current Detected by Telephone Receiver

Electricians at times find it necessary to distinguish alternating-current lines, or switches, from those on direct-current circuits, when both kinds of current are used on the same system, and the switches or conduits are installed close together. With a pair of high-resistance telephone receivers, the difference is easily detected. Connect them with two short cables, so as to form a complete circuit, and hold one of them against the ear and the other close to the switches, or conduits, which are to be distinguished. When the second receiver enters the field set up about a switch, or conductor, on an alternating-current circuit, the humming sound identifying it will be transmitted to the receiver held against the ear. No battery, of course, will be used with the receivers, and caution is necessary to avoid touching any live part on the circuits.—H. S. Rich, Hartford, Conn.

Opening a Milk Can

To make pour-out and vent holes in a condensed-milk can, place the can-opener point with the back of the blade toward the center of the can; punch a hole through, and cut a slot to the outside of the circle, or circumference of the can. This permits a clean-cut stream of milk to flow, and does not give a slobbering effect as does the usual haphazard method of puncturing the can.—T. J. Hubbard, Mendota, Ill.

¶ When no soft-tone phonograph needles are at hand, use a loud-toned needle and insert halfway.

A Water-Power Fan for the Hot Days

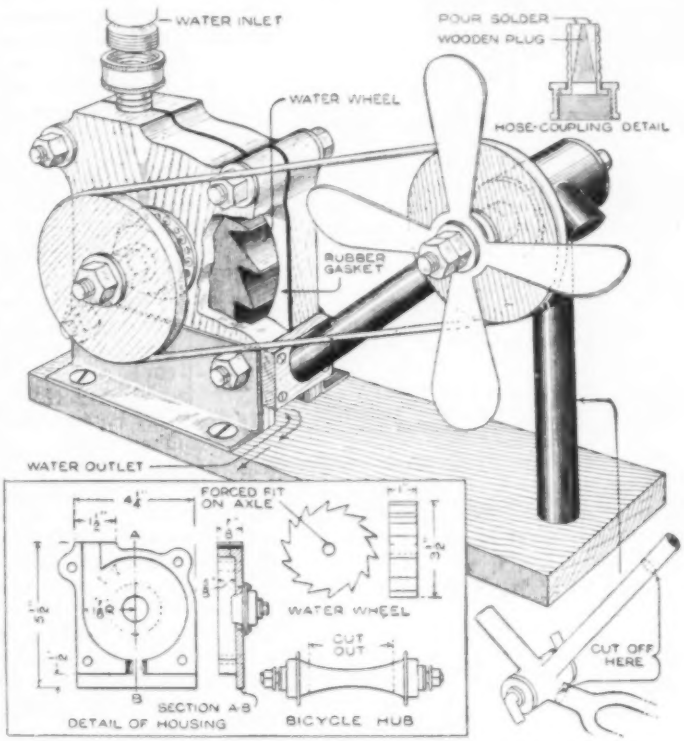
By JOHN SCHOE

A CYCLIST whose machine was ready for the junk pile used parts of it in the construction of a water-driven fan drawing his power from a kitchen faucet. The fan revolved on the crankshaft of the bicycle, from which the cranks and sprocket had been removed, and was connected by a belt with a water wheel, inclosed in a wooden housing. An installation of this kind can be made by anyone who has a bicycle that has outlived its usefulness, and if he has access to a small lathe and band saw, his work will be much simplified.

Build the motor first, beginning with the housing. Make this in separate halves, using a lathe, if one is obtainable, to reproduce the shape shown in the illustration, and keep closely to the figures given for the interior dimensions, which allow a clearance of ⅛ in. at the sides and circumference of the water wheel. Then prepare bearings for the housing by cutting the ball races with a hacksaw from the front hub of the bicycle, and force them into holes bored in each half of the housing, taking care to make the metal a water-tight fit against the wood. Next, cut out a wooden water wheel with the band saw, and bore a hole through the center, large enough to make a force fit on the front axle of the bicycle. Thrust the axle through it, and also through the ball races, and then bolt both halves of the housing together, using pieces of rubber, cut from the inner tube of a tire, to serve as a gasket. The axle must project far enough from one side of the housing to hold a wooden pulley, secured by the locknut and washer previously used outside the fork of the bicycle. The thickness of the housing must be such as to give this projection, but not so much that the cone nuts will reach the end of their threads. The length of the axle, and of the threads upon it, should therefore be checked up, and if the housing is not thick enough when made of ⅞-in. wood, thicker stock should be used, or a wooden shim put in.

An ordinary garden-hose coupling connects the housing with a rubber hose which supplies water from a faucet. In the half of the coupling which is pressed into the housing, a nozzle is formed by inserting a cone-shaped wooden plug and pouring in solder, as shown in the detail. The plug is then driven out. A hole, ½ in. in diameter, is bored at the bottom for drainage, so that the motor may be placed in the sink over the escape pipe.

Throughout the rest of the equipment, less precision is necessary in working to dimensions. Cut a fan from a sheet of heavy tin, and bend the blades to an angle of 20° with the plane of the hub. The bicycle crank hanger will furnish a bracket and bearing, the parts of the frame which are not used being cut away with the hacksaw. Mount the hanger on a wooden base, and fit the fan and a



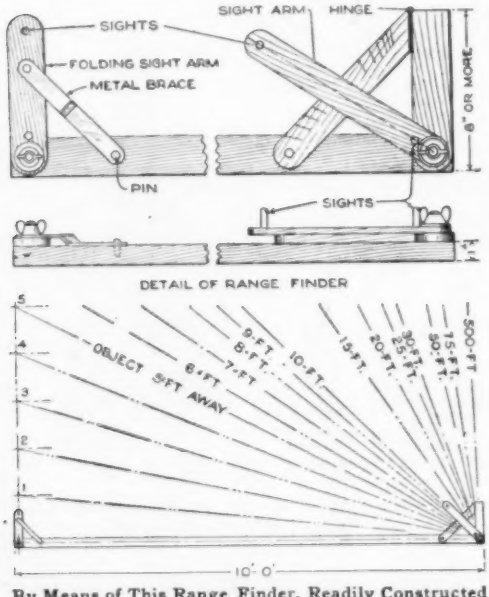
A Water Wheel, Operated from a Kitchen Faucet, Serves as a Motor to Drive a Homemade Fan. Parts for Making Both were Obtained from an Old Bicycle

wooden pulley to the crankshaft, as shown. The wooden pulleys on the fan and on the motor present no problem if a lathe is used, while even a wood chisel will turn out a thoroughly serviceable job. Each pulley must have a groove wide enough to take an ordinary sewing-machine belt. A flat belt may be used if easier obtained, and the pulleys should then be crowned instead of grooved.

After assembling all the fan and motor parts, connect both units with the belt, and complete the installation. Two pieces of strap iron are sufficient to secure the wheel housing to the base that supports the fan, or scrap metal can be taken from other parts of the machine to serve this purpose. The whole installation will then stand firmly when the water is turned on, and the speed developed will be about the same as that obtained on most small electric fans.

A Model Range Finder

An article that will prove of interest to boys who go camping, or take hikes, is a range finder, which enables two boys, by sighting across points at the end of it, to



By Means of This Range Finder, Readily Constructed from a Few Sticks and Nails, Distances can be Determined without Actual Measurement

tell the distance to any object within 100 ft. or more. The base of the range finder is a stick 10 ft. long. If one does not wish to carry an object of this length, it may be hinged on the broad side and folded up to 5 or 2½ ft. At each end of the 10-ft. stick, a shorter stick is fastened, in which are driven headless nails to form sights. Two of these are set in each short stick, one at either end, and at least 7 or 8 in. apart. At the left end the short stick holding the sights is fastened by a wing nut and bolt through one end, and a metal brace is set diagonally to hold the sight arm at right angles with the base. One end of this brace can be fastened permanently with a screw; the other end may have a pin which fits tightly, but allows the brace to be removed and the whole folded up parallel with the base for carrying. At the right end is a sight arm similarly pinned, but without the brace. Instead, two other sticks are mounted to form with the base a right-angled triangle, as shown. These sticks can be fastened permanently with screws, or, if the feature of folding up parallel to the base is desired here also, they can be attached with pins similar to the one at the other end.

The sight arm at the right end swings over the stick which forms the long side of the triangle, and marks are made on the latter to indicate the angular position of the sight arm. These marks should be determined by experiment, setting up some object at measured distances from the observers, setting the sight arms, and making a mark to indicate the position for each distance.

The method of using the range finder will be apparent from the lower diagram. Two boys hold the instrument, one at each end. The one at the left end turns the range finder to such a position that the object to be observed is in line with his two sights. The other boy then turns his sight arm until his sights are also in line with the object. The reading of the scale will then indicate the distance of the object from the observers.

It may be noted that no measurements of either angles or lengths really have to be made in building the instrument; the only lengths that have to be measured accurately are the distances to the object used for the purpose of locating the scale marks. The workmanship must, however, be careful and accurate, and if folding or hinged joints are used, there must be very little play in them, or the accuracy of the instrument will be destroyed. This is shown by the fact that in the part of the scale which will actually be used in measuring the objects at a considerable distance, the scale marks come quite close together. It will be

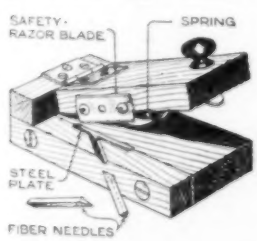
seen from this, also, that the longer the sight arms are made, the greater is the accuracy which can be obtained.—Wayne W. Leyrer, Atlantic City, N. J.

Motor-Driven Egg Beater

A small electric motor, which had become unfit for shop work, was used by one of the mechanics in his home kitchen, where it rendered good service in beating eggs, whipping cream, and even churning butter. He screwed it to the kitchen wall, with the drive shaft in a vertical position, and as this adjustment threw all the weight of the armature onto the lower thrust bearing, he placed two mica washers between the bearing and the shoulder of the armature. The power was transmitted to the egg beater by means of a collar, pinned permanently to the lower end of the shaft, and the top of the egg beater was thrust into the collar and held firmly with a thumbscrew, so that it revolved with the shaft. The beater was made from a piece of fairly coarse iron wire, twisted into spirals at its lower end, where it entered the dish or pan containing the eggs. To prevent the weight of the thumbscrew from causing the shaft to turn unevenly, a small lump of solder was used as a counterweight on the collar, opposite the screw. Several wire beaters were made and twisted into different shapes, so as to adapt the machine to the nature of the work which was to be done.

Cutter for Fiber Phonograph Needles

A function for old safety-razor blades is found by using them to sharpen fiber phonograph needles. The blade is attached to a small rectangular piece of wood, which is fastened to a base by a hinge, and operates like an ordinary paper cutter. When the upper leaf is pressed down, the blade enters a slot which is cut in the base before assembling, while a groove running at an angle to the slot holds the needle, the angle determining the sharpness of the point to be made. The slot is faced with iron at the side in which the groove ends, the iron fitting snugly against the blade as it descends, so as to insure a clean cut.



Music Rack Makes a Convenient Camera Tripod

In view of the present high cost of camera tripods, camera users whose homes are provided with music racks may find it convenient to arrange the rack so that it can be used as a tripod for taking time exposures with any kind of a small camera. For a few cents, a machine shop will turn out a threaded end to screw into the tripod socket of the camera, and to attach to the end of the music-rack staff, after the upper frame has been detached. If it is not convenient to make such a fixture or have it made, the tripod-head ball joint can be bought from a photographer's supply shop for about 50 cents. The staff of the music rack will pass through the threaded hole in the bottom of this accessory, and the top of the staff may be clamped between the two halves of the ball-joint jaws, by tightening up the wing nut. The camera may then be screwed into its place on top of the ball joint, where it is rigidly supported. Good music racks are always provided with a vertical adjustment, which will be useful with the camera; it is always desirable to get the lens as nearly level with the subject as possible, and many bad pictures are the result of failure to do this. The ball-joint fixture, if used, permits tilting the camera.

Mirror Bait for Raccoon Trap

To catch a raccoon without using edible bait, use a steel trap of medium size, with a mirror, or piece of tin foil, laid flat on the bait pan and secured in position with solder or wire. Set the trap, in water if possible, by some creek, or in some gully, where the tracks of a raccoon have been found. He is a very inquisitive animal, and when he sees light reflected from any surface, he is apt to paw it with his foot—in this case to his own destruction.—J. W. Reynolds, Mason, Ill.

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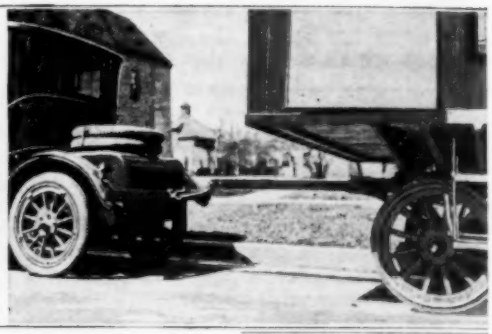
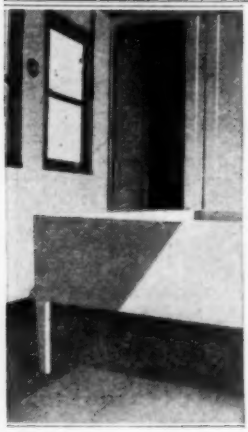
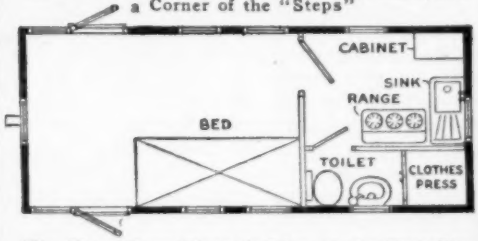
AUTO TRAILER IS LUXURIOUS BUNGALOW



Hitched to Its Auto and Ready for the Road, the Traveling Home is Seen in the Upper Left-Hand View. At the Right We See the Front Running Gear, the Method of Attaching to the Auto, and a Corner of the "Steps"





The Plan Above Gives an Idea of the Homelike Arrangement Inside; at the Left Is a Corner of the "Parlor," in Which Part of One Bed Is Visible. The Spot between the Windows Is an Electric Light. Over at the Right Is the Lavatory, with Its Nickeled Pump for Drawing Water

TO a great many people, a camp is attractive only in theory. It suggests hardship, or at least hard work, and that is pleasing only to a certain robust minority. A fully equipped summer home that could be hitched on behind a small auto, and rolled through the landscape at the will of the vacationer, is about the only contrivance that promises to meet all tastes and overcome all objections.

It sounds like a large order; yet a Chicago designer has accomplished it. His trailer is a cottage—a bungalow, if you like—with running water and toilet facilities, and a regular cookstove and beds with mattresses. The front part, or observation compartment—call it living room if you prefer—has seven plate-glass windows that drop into the frame, and two glass doors. Besides the folding bed (which takes a box spring if the owner be a real sybarite) and the folding table, there is room for an upright piano; though some will prefer to pile trunk loads of clothing in the space.

The kitchenette at the back contains a cabinet, a range for coal or wood, and a sink, and has two windows. From it opens a little lavatory with regular bathroom fittings, a medicine closet, a clothes press, and a window. The water comes from a tank underneath, and is drawn up by a small nickeled pump. The "house" is wired for seven electric lights, supplied from the auto or a battery.

The body is built on a frame of hickory, oak, and elm, finished inside with painted wall board, and covered outside with sheet steel, enameled like an automobile. Steel running gear, artillery auto wheels on ball bearings, and solid-rubber tires put the itinerant dwelling in readiness for any reasonable road, with delightfully indeterminate stop-over privileges at all points. The whole trailer, 20 by 8 ft. and 7 ft. high, weighs about 1,700 pounds.

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